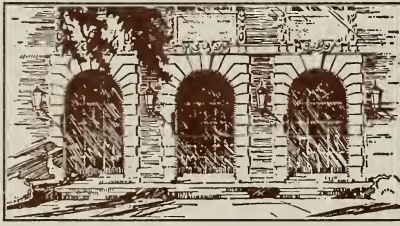




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**Holm Wolfram Neumann**

Ph. D., M. D.

# **The Paleopathology of the Archaic Modoc Rock Shelter Inhabitants**

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THE PALEOPATHOLOGY  
OF THE ARCHAIC  
MODOC ROCK SHELTER  
INHABITANTS

by  
Holm Wolfram Neumann, Ph.D., M.D.



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July 1967

Holm W. Neumann

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# THE PALEOPATHOLOGY OF THE ARCHAIC MODOC ROCK SHELTER INHABITANTS

## ABSTRACT

This publication constitutes a study of the osteopathology found in a series of prehistoric Archaic American Indian skeletons from Randolph County, Illinois. The study is primarily concerned with the diagnosis and classification of diseases as manifested in these skeletal remains. A basic method for the study of prehistoric osteopathology was outlined and each skeleton was examined in detail. Any abnormalities or pathological changes were described and these changes were then placed into a classification of the various disease processes which affect the bony skeleton.

A surprisingly high incidence of bone pathology was found in the series, with only three of twenty-eight skeletons showing no evidence of abnormal change. A majority of the various disease processes in the classification were represented. Although the size of the sample was too small to demonstrate meaningful conclusions on the race, sex and age incidence, it did show that archaeological material can serve as a valuable source for the study of gross bone pathology and the natural history of untreated (by modern methods) disease which may affect bone.

## INTRODUCTION

### 1. *The Problem*

To the present day, relatively little effort has been devoted to the study of paleopathology. No clues are available from any of the numerous perishable soft tissues or organs (except in a few rare instances where mummification has occurred). Limited data on morbidity or mortality of prehistoric human populations are available from bone or other mineralized tissues or matter (calculus, etc.), but the immediate cause of death will remain a mystery in most cases.

With the exception of an occasional case in which newly devised methods and techniques may be utilized, the study of skeletal remains is limited to gross examination. Preparations of demineralized bone for microscopic study are of little value since perishable non-mineralized tissue is absent. Diagnosis, when possible, must be made upon the gross appearance of the pathological bone specimen or on radiological evidence. Often the lesions which are encountered can be given only

a descriptive rather than a specific diagnosis since, in a number of cases, two or more disease vectors may result in morphologic changes that are indistinguishable. The osseous remains of an individual skeleton may be fragmentary; and poor preservation in the soil and poor archaeological excavation techniques -- or inadequate treatment and preservation after excavation -- are additional factors complicating paleopathology.

In examining prehistoric human skeletal remains, one cannot help but notice the relatively high incidence of pathology present. It is this fact which, after having attracted the author's curiosity, has led to the following survey of the pathological bone remains of the Modoc Rock Shelter "population" (one which is especially rich in bone pathology). It can be readily noted that such a study is interdisciplinary in scope, spanning both the medical sciences and the field of anthropology. Since these burials represent some of the earliest human remains found in the State of Illinois, they are of particular interest from a prehistoric as well as a historical point of view.

The majority of the skeletal remains to be examined were carefully excavated and are of determinable antiquity, sex, racial and cultural affiliation. One also can roughly determine the approximate age of the individuals at time of death, certain pertinent ecological factors, subsistence pattern and economy. The study is primarily concerned, however, with the classification of diseases as manifested in the skeletal remains. An analysis of the incidence, sex and age distribution, etiology, history or antiquity and the pathogenesis of some of the diseases affecting the skeletons of this prehistoric "population" has been attempted. It is hoped that this brief survey will serve as the beginning of a similar study on a larger, more comprehensive scale, dealing with populations which lived under differing climatic conditions, had different subsistence and cultural patterns, different dietary intakes and exhibiting racial and constitutional differences. Comparisons and correlations could then be made with present day clinical data.

Information concerning the role which heredity and race play in association with certain pathological conditions may be sought in such a study since the majority of the populations to be studied are composed of relatively small, inbred, homogeneous groups. Finally, it may be noted that in this particular survey, all the evidence of pathology is direct; there are no indirect clues such as may be found in pictographs, decorated pottery, etc. to aid with the investigations.

## 2. The Sample

The series of skeletal remains studied is comprised of a group of burials recovered by the Illinois State Museum, University of Chicago, and Illinois State Museum Society during four separate seasons of excavation (1952, 1953, 1955, and 1956).<sup>1</sup> Twenty-eight burials, ranging in age from less than fourteen years to over seventy years, are represented (Table I). There are fourteen burials of each sex, although four of the female skeletons and one of the males were quite incomplete (consisting of as little as a mandible or

skull). Radiocarbon dates place the earliest burials at 6219 B.C.  $\pm$  488 years, and the most recent at 2765 B.C.  $\pm$  300 years. All belong to either the medial or the terminal Archaic cultural periods.

At least three physical varieties or racial types of American Indians are represented, and the significance and the racial variability of the inhabitants is presently under study by Prof. Georg K. Neumann of Indiana University.<sup>3</sup>

The Modoc Rock Shelter consists of an occupied area, approximately 30 feet wide by 300 feet long, beneath an overhang along a sandstone bluff on the Mississippi River flood plain, two miles northwest of Modoc, Randolph County, Illinois. Evidence of human habitation of the site has been found as far as twenty-seven feet below the present soil surface under the overhang.<sup>4</sup> All of the available skeletal material from the site is included in the series.

It is believed by Winters et al.<sup>5</sup> that the Modoc Rock Shelter had its maximum occupational intensity and concentration of population between 3500 - 4000 B.C. Following 3500 B.C., the site is thought to have changed from a domestic habitation to a specialized hunting camp during which a seasonal occupation prevailed. Hunting, gathering, manufacturing and domestic activities were all carried out at the site.<sup>6</sup> A late fall to early spring seasonal utilization for burial and habitation is indicated. It may have been that an elderly population inhabited the shelter where food was very abundant.

Finally, one should keep in mind that the term "population" must not be taken in the strict sense of the word, since the series studied includes inhabitants of the rock shelter over a 3500-year time span.

2. The Eastern Archaic culture is representative of those tribes utilizing a hunting and gathering type of economy in the wooded ecological setting of lower North America. These peoples first appeared sometime prior to 8000 B.C. and underwent a series of changes within this type of economy throughout the subsequent 7000 years.

3. For a detailed physical description of these varieties (i.e. Iswanid, Lenid and Illinid) see Neumann, G. K., "Archaeology and Race in the American Indian." In: James B. Griffin, (ed.), 1952, *Archaeology of Eastern United States*. Chicago: University of Chicago Press, pp. 13-34.

4. Fowler, Melvin L., op. cit.

5. *Ibid.*

6. *Ibid.*

1. Fowler, Melvin L., Modoc Rock Shelter, *Reports of Investigations*, No. 8, Springfield: The Illinois State Museum, 1959.

### 3. The Method

In making an analysis of the osteopathology in this type of material, certain basic points and principles should be kept in mind and followed. First, the analysis is purely morphologic. There are only a limited number of ways in which bone can react to disease, and in turn we are limited to a quantification of the patterns of bone destruction, repair and adaptation. As stated in the Introduction, we rarely can show a 1:1 etiological specificity in dealing with such bone changes. Thus, in working up the material, one basically must describe the abnormal findings, quantitate these findings, map out or localize the findings, and attempt to estimate the period of time necessary for any changes in a bone to have taken place.<sup>7</sup>

If this outline or method of analysis is followed, one can usually define a disease process which may have occurred and not be misled into making a specific etiological diagnosis which may be in error (or an impossibility under present techniques of investigation). Although considerable overlap may exist, the following broad classification of disease processes or categories of joint and bone pathology will be followed in this survey:

- A. Anomalies in Growth and Development (hereditary and non-hereditary or acquired)
- B. Disorders of Metabolism (including endocrine and storage diseases)
- C. Regressive Changes (atrophy, dysplasias, etc.)
- D. Traumatic Lesions (fractures, dislocations, osteoarthritis, etc.)
- E. Inflammatory and Granulomatous Disease (osteomyelitis, tuberculosis, lues, systemic fungal disease, etc.)
- F. Neoplasms (benign and malignant)
- G. Neuropathic Lesions (Charcot joint, syringomyelia, etc.)
- H. Lesions Secondary to Circulatory Disorders (bone infarcts, etc.)
- I. Changes Secondary to Hematologic Disease (anemias, leukemias, etc.)
- J. Idiopathic or Diseases of Unknown Etiology
- K. No Bone Pathology in Evidence
- L. Dental Pathology

Both local and generalized disease processes are included in the classification. A notation of any significant dental pathology has also been made. However, this subject is worthy of a paper in itself and will not be studied or described in detail here.

The skeletal remains from each burial in the "population" were systematically reviewed and observed for any abnormal findings or bone pathology. Several of the specimens were also x-rayed in order to obtain any additional evidence of disease. Each bone or joint was considered separately and any pathological changes were described on an observation blank for the skeleton. Criteria used in making the descriptive diagnoses can be found in sections discussing the various disease processes. In some cases a more specific diagnostic impression or limited differential diagnosis will be attempted.

In addition to the observations on pathology, information on age, sex, antiquity, etc.<sup>8</sup> is recorded for each burial on the observation blank for ready reference and for the sake of convenience.

For the observations made on the various joints, a scale of 0 to 5 was utilized to quantitate any osteoarthritic involvement present. A rating of 0 indicates no osteoarthritic changes to be present. A rating of 1 or 2 is to be considered as representing mild involvement, possibly only primary or ordinary "wear and tear" arthritis. A value of 3 is considered as moderate while 4 or 5 represents the presence of a pronounced or advanced osteoarthritic change in the joint.

In Table III, a summary of any significant pathology in each skeleton is given.

8. See Neumann G. K., *Laboratory Manual of Physical Anthropology* (in preparation), 1966, for methods employed in the assessment of age and sex to skeletal material.

7. Johnson Lent, Discussion at Symposium on Human Pathology, Academy-Research Council Building, Washington, D.C., January 14, 1965.



## RESULTS

### A. Anomalies in Growth and Development:

Four of the burials in the series showed evidence of anomalies in growth or development of the bony skeleton. One burial (Ra501-17), a sixty-eight-year-old male, exhibited evidence of a spina bifida occulta with the incomplete closure of the sacral bones. No other anomalies were found in this individual.

Two other burials (Ra501-19), a forty-five-year-old male, and (Ra501-25), a forty-seven-year-old female, exhibit a non-union of the first sacral vertebra to the remainder of the sacrum. In addition, the former of these two burials has a manubrio-corporal union of the sternum, and the latter shows an incomplete development or failure of fusion of the neural arch of an upper cervical vertebra.

Burial Ra502-1, a seventy-year-old male, also has a manubrio-corporal union of the sternum (Fig. 28). In addition, sternebra number four has a 1 cm. circular perforation which probably represents the failure of fusion of its bilateral centers of ossification.

### B. Disorders of Metabolism:

No evidence of bone pathology secondary to a disorder of metabolism was found in this series.

### C. Regressive Changes:

Of the three principal regressive changes which can occur in bone (atrophy, necrosis, or dysplasia), only atrophy and osteoporosis, a sequela of atrophy with rarefaction and bone porosity, are represented in three skeletons in the series under study. Burial Ra501-15, a thirty-five-year-old female, shows atrophy of the left upper extremity with small, light and fragile bones which probably was secondary to immobilization or disuse following early trauma to the head of the humerus and prior to fusion of its epiphysis (see section on traumatic lesions and Fig. 8). All of the bones of this extremity show rarefaction and porosity. The cortical bone is thinned out and the trabeculae are reduced in number. The above suggested etiology does seem to be more likely than local involvement due to pressure, neurovascular changes or a generalized diffuse process such as aging, hormonal or nutritional disturbances.

A generalized osteoporosis with cortical thinning and light, fragile bone with a decrease in number of trabeculae throughout the bony skeleton is present in two burials in the series (Ra501-17, a sixty-eight-year-old male, and Ra502-1, a seventy-year-old male). In the latter individual, disuse as well as advanced age was probably a causative factor, since this skeleton also exhibited evidence of rheumatoid spondylitis (Fig. 30) and a very marked osteomyelitis involving both femora (Fig. 31). The former case probably represents a generalized osteoporosis secondary to aging. Conceivably, this could also represent a hormonal or nutritional disturbance; however, no evidence for these two possibilities was present.

### D. Traumatic Lesions:

#### 1. Traumatic Fractures:

Eight of the burials in this series exhibited evidence of traumatic fracture of one or more bones in the skeleton. Two burials exhibited traumatic injuries of the skull. Burial Ra501-12, a sixty-five-year-old male, had a well-healed depressed fracture of the zygomatic process of the right frontal bone. A second depressed fracture is readily apparent in Burial Ra501-24, a twenty-eight-year-old male, whose outer table of the left parietal and frontal bones shows a depression measuring approximately 2.5 X 1 cm. (which crosses the coronal suture to involve both of the above mentioned bones).

The lower extremity was involved in one case (Ra501-16), a fifteen-year-old male, where a crushing injury to the right foot involving both metatarsals and phalanges is found (Fig. 11).

Seven different individuals exhibited traumatic injury to the upper extremity. A healed traumatic fracture of the proximal half of the left fifth metacarpal bone is present in Burial Ra501-19, a forty-five-year-old male. This burial also exhibits a non-united, complete, traumatic fracture at the mid-shaft of the right radius (Fig. 22). Arthritic changes as found in this pseudarthrosis are discussed in the section on osteoarthritis. The left radius of Burial Ra501-18, a forty-five-year-old male, exhibits a well-healed fracture at its distal end (Fig. 15),



and Burial Ra501-12, a sixty-five-year-old male, has a well-healed traumatic fracture of the distal third of both the right radius and ulna (Fig. 6); secondary osteoarthritic changes are to be noted in the right wrist. The left clavicle of this skeleton exhibits a well-healed fracture at its mid-shaft.

In all probability, an avulsion of the triceps tendon from the right ulna resulted in the pathology present in a sixty-eight-year-old male (Ra501-17). The region of the insertion of the tendon into the olecranon process is very pitted, roughened and irregular, but no necrotic bone and little inflammatory change is present. Only a small amount of new bone formation is in evidence (Fig. 12).

The left humerus of Burial Ra501-20, a thirty-five-year-old male, has a well-healed, well-aligned, but considerably over-riding fracture of the mid-shaft. The shortening in the length of this bone is readily apparent, especially when a comparison is made with the right humerus (Fig. 23).

Evidence of a traumatic injury to the shoulder prior to the closure of the epiphysis of the head of the humerus to its diaphysis can be seen in the humerus and scapula of Burial Ra501-15, a female of thirty-five years of age. The head of the involved humerus, as well as its articulating glenoid fossa of the scapula, shows extensive pitting, roughness, atrophy and marked degenerative changes. The bones of this extremity all show atrophic changes, osteoporosis and a small, fragile appearance (Fig. 8). A well-healed fracture of the right clavicle (Fig. 4) was present in Burial Ra501-12, a sixty-five-year-old male.

## 2. Osteoarthritis:

Osteoarthritis is generally considered to be a chronic type of arthropathy, primarily of a degenerative nature, and it apparently develops to some extent in nearly all individuals over thirty-five years of age. Following the exposure of subchondral bone, the involved region becomes eburnated and marginal lipping (osteophytosis), pitting, erosion and other signs of wear and tear develop. This wear and tear on the various joints, which may develop over the course of several years, can be monoarticular or polyarticular in nature. In some cases,

however, the involvement may obviously take place in a much shorter period of time. The usual course of development of this type of joint pathology follows (as mentioned above) the pattern of degenerative alteration with destruction of the articular cartilage and exposure of underlying bone. Subarticular bone thickening due to compression and new bone formation then follow. Finally, ossified islets of new bone may produce osteophytes or bony spurs and lipping. Large spurs in articulation with one another may eventually produce functional limitations in range of motion.

I have chosen to classify this disorder within the group of traumatic changes because, whether due to continued "micro-trauma" over long periods of time (i.e. wear and tear), or due to more rapidly developing pathology from gross trauma or infection, a similar type of tissue response occurs. A coordinated re-absorption and apposition of bone takes place and the characteristic changes follow. The osteophytosis may be considered as an attempt at functional reconstruction and, as Weinmann and Sicher state,<sup>9</sup> an osteophyte is made up of primitive, immature, coarse, fibrillar bone. It represents an adaptive change in a joint which can not withstand functional stress.

This form of disease is the most common type found in the series with twenty-two of the twenty-eight burials showing evidence of osteoarthritis. Involvement of the various types of joints in the skeleton can be found in one or more of the skeletons examined (see Observation Blanks). Both monoarticular and polyarticular involvement are represented and the age of the individuals with this pathology ranges from fifteen years to over seventy years. The males with this "disease" have a mean age of 41.9 years while the females show a mean age of 42.7.

Although the series is not large enough to draw numerous conclusions as to incidence by sex, race, age or relative involvement of various joints, certain trends may be indicated (see Observation Blanks). One must certainly keep in mind, however, that

9. Weinmann, Joseph P. and Sicher, Harry, *Bone and Bones*, St. Louis: the C. V. Mosby Co., 1955, p. 174.

the results may largely reflect the relative incompleteness of the various burials in the series. Reference should be made to the numbers of each joint represented in the series as well as to the numbers of each joint showing osteoarthritic pathology.

The cervical (especially CV) and lumbar vertebrae, ribs, ulna at the elbow joint, sacroiliac, hip (acetabulum), intertarsal, and metatarso-phalangeal joints show the most frequent or significant degree of involvement. Surprisingly, little involvement of the knee joints and distal interphalangeal joints was present. The temporo-mandibular joint is involved in three individuals, a higher incidence than was originally expected; this may possibly reflect food preparation and dietary habits. Certain bones within a given joint, such as the hip or elbow joints, exhibit a greater degree of involvement than their articulating bone companions (i.e. acetabulum more frequently and significantly involved than the head of the femur or ulna-humeral joint, showing a greater degree and more frequent involvement than the radial-humeral articulation).

In many cases the osteoarthritic changes are strictly localized and obviously secondary to a traumatic lesion or tumor. This is especially true in some of the younger-aged individuals in the series. The fact that mechanical stress is indicated as the chief factor by which joint function contributes to the development of osteoarthritis is supported by the location of asymmetrical osteoarthritic pathology found in several of the burials examined. For example, Burial Ra501-19 exhibits osteoarthritic changes in the pseudarthrosis in its fractured ulna (Fig. 22) and osteophytosis and other osteoarthritic changes on only one side of its involved vertebral bodies. Another burial has osteoarthritic involvement of the articular facets of the vertebrae and not the vertebral bodies. Other examples show unilateral involvement at the temporo-mandibular joint.

It may be noted at this point that a stature and constitutional analysis would certainly be of interest also. Unfortunately, with this small a series, such a study is not possible. Also, there is not enough evidence present in this population to support my previous observations on other series of a

more significant and earlier development of osteoarthritic pathology at the symphysis pubis in females (possibly representing stress from childbirth). Finally, in general, the males show a greater degree and frequency of osteoarthritis than the females, which may reflect the effects of the division of labor present in this group.

#### E. Inflammatory and Granulomatous Disease:

Although a specific etiological agent cannot be demonstrated, bony lesions with pathology compatible with an inflammatory process were found in three burials in the series. Burial Ra501-15, a thirty-five-year-old female, shows evidence of a healing pyogenic osteomyelitis of the middle third of the shaft of the right tibia (Fig. 9). The bone exhibits areas of destructive necrosis and bony repair, and devitalized bone spicules and foci of necrotic cortical bone are in evidence. New bone formation can be seen throughout the involved area. Although destruction of cancellous marrow spicules and erosion and destruction of cortical bone are present, no sequestration, open sinus tracts or involucrum formation are observed.

A similar involvement of the bone is to be found in Burial Ra501-26, a forty-five-year-old female. In this specimen, however, an osteitis rather than an osteomyelitis was represented, although no evidence of marrow involvement was noted. The greater trochanter of the left femur exhibits some erosion and pitting as well as some new bone formation which could be compatible with such a diagnosis. A similar such lesion is to be found in the proximal ulnae of this individual.

Burial Ra502-1, a seventy-year-old male, exhibits a most severe case of osteomyelitis. The distal and middle thirds of both femora show very extensive bone destruction in both the marrow and bone cortex (Fig. 31). Much bone necrosis is present and scattered areas of new bone formation can be seen. The distal femoral epiphyses are missing, and it is not possible to determine whether or not they were involved.

#### F. Neoplasms:

Evidence of benign neoplasia can be found in three of the specimens in this series. The skeleton of a forty-five-year-old male (Ra501-

19) exhibits a lesion consisting of a large cavity in the body of the second lumbar vertebra. A localized lysis of the bone of seventy-five to eighty percent of the vertebral body has occurred. There is no evidence of any suppurative type of bone destruction or necrosis, and no new bone growth or tissue repair can be seen. This type of pathology could well have resulted from the presence of a hemangioma within the marrow of the vertebral body, not an unusual location for this type of vascular tumorous malformation. Other osteolytic disease processes must be ruled out (such as metastatic malignancy), but the above suggested diagnostic impression seems most likely in light of the local pathology which is present. A rather marked secondary osteoarthritis is also present in this vertebra and in those adjacent to it (Figs. 18, 19, 20).

A similar type of lesion is represented in the acetabulum of the left innominate bone (Fig. 24) of Burial Ra501-20, a thirty-five-year-old male. Here a lysis of the bone has produced a perforation or erosion through the acetabular floor. The lesion appears as a sharply circumscribed defect with some increased density in the bone "lining" the involved area. The pathology suggests a slowly expanding type of disease process (as one would find with a benign tumor) and not one of rapid destruction.

A well circumscribed 3.5 X 3.5 cm. elevation of dense bony tissue is present in the temporal line above the zygomatic-frontal articulation of the left frontal bone (Fig. 32) of Burial Ra502-2a, a twenty-eight-year-old female. This mound-shaped bony elevation could well represent a local osteoma which, although a relatively uncommon tumor, does occur most frequently in the skull. No evidence of any malignant neoplasm of bone was present in any of the skeletons in the series.

#### G. Neuropathic Lesions:

No evidence of any bone pathology developing secondary to neuropathic disease was found in this series.

#### H. Lesions Secondary to Circulatory Disorders:

No evidence of bone pathology secondary to circulatory impairment was found in this series.

#### I. Changes Secondary to Hematologic Disease:

No bone pathology secondary to hematologic disease was noted in this series.

#### J. Idiopathic or Disease of Unknown Etiology:

One example of a disease fitting this category was present in the series. A very characteristic affection of the spine as is found in rheumatoid spondylitis (Marie-Strümpell disease) can be seen in Burial Ra502-1, a seventy-year-old male. A complete ankylosis of the spine with calcification and ossification of the spinous ligaments (Fig. 30) resulted from this type of "inflammatory" arthritis which extended from the level of TIII through LV. A rather marked dorsal kyphosis has resulted and a secondary osteoarthritis in the spine is to be found above the level of the involved vertebrae.

#### K. No Bone Pathology in Evidence:

No significant pathological changes could be found in the skeletons of three burials in the series. One of these burials consisted of a skull only, and since the individual was a female of seventy-three years of age (Ra501-21), it is quite likely that at least some osteoarthritis could exist in the missing skeletal parts. The other two skeletons, Ra501-11 (an eighteen-year-old male), and Ra501-22 (a female under fourteen years of age), although more complete, were both of sub-adult age.

#### L. Dental Pathology:

Eight burials in the series exhibited some form of dental pathology, ranging from marked dental attrition (Fig. 14), possibly reflecting subsistence pattern and diet, to peridontoclasia to the presence of alveolar abscesses (Fig. 13) or pre-mortem loss of teeth. The pathology was found in both sexes with an age range of thirty-five to seventy years. No detailed analysis of this pathology was attempted since an endeavor would involve a separate study in itself.

A listing for reference can be found in Table III which summarizes the pathology found at the Modoc Rock Shelter.

## CONCLUSIONS

As a result of this comprehensive survey in paleopathology, the following conclusions can be made:

First of all, this survey provides a description of the osteopathology found in the human skeletal material excavated from the Modoc Rock Shelter. It was quite surprising to find such a high incidence of bone pathology in a series of this size. Only three burials exhibited no evidence of such pathology; one of these was a grossly incomplete skeleton (skull only), while the other two were of sub-adult age. A seasonal habitation of the site (late fall to early spring) is indicated, and evidence points to the fact that aged individuals occupied the rock shelter where an abundance of food was readily available. This factor may account for the high incidence of pathology present. A rugged, difficult mode of subsistence is probably also a contributing factor as these peoples were hunters and gatherers and their way of life was certainly physically demanding.

Of the various disease processes outlined in the classification, examples of all except four were present in this series (i.e. metabolic disorders, neuropathic lesions, lesions secondary to circulatory disorders, and changes secondary to hema-

tologic disease). In a number of the burials, two or more disease processes were represented. Of the various types of bone pathology present, osteoarthritis represents the one most frequently found. Mechanical stress is indicated as the chief factor by which joint function contributes to the development of osteoarthritic changes, and evidence for this is well demonstrated by the location of the characteristic lesions.

Due to the small size of the sample, meaningful conclusions on the race, sex and age incidence are difficult to assess. A comparative study with other such populations would be advisable in this respect, and this survey can serve as a basis for such future studies. More information on the effects of differing cultural patterns, diets and subsistence patterns may also then become apparent. A basic method for the study of prehistoric osteopathology has been outlined and should easily be applicable to other series of skeletal material. Finally, it has been shown that archaeological material, when excavated under adequate test conditions, can serve as a fine source of study material for gross bone pathology and the natural history of untreated (by modern methods) disease which may affect bone.

TABLE I  
SKELETAL AGE OF BURIALS FROM MODOC ROCK SHELTER

<i>Number</i>	<i>Sex</i>	<i>Suture</i>	<i>Dental</i>	<i>Pubis</i>	<i>Epiphysis</i>	<i>Average</i>
Ra501-4	Male	42-47	50			47
Ra501-5	Female	26-29		24-27	27-28	27
Ra501-6	Female	29-35	30	-	-	32
Ra501-7	Male	-22	19		19	20
Ra501-8	Female				-18	18
Ra501-9	Male					old
Ra501-11	Male				18	18
Ra501-12	Male	51-65	65plus			65
Ra501-13	Male	42-47	40			42
Ra501-14	Female	65-81	65plus			65
Ra501-15	Female	35-38	35			35
Ra501-16	Male	-	-	-	15-16	15
Ra501-17	Male			68		68
Ra501-18	Male	42-47	55	40-45		45
Ra501-19	Male					45
Ra501-20	Male	-	35	-		35
Ra501-21	Female	65-81	70	-	-	73
Ra501-22	Female	-		-		13
Ra501-23	Female		70			70
Ra501-24	Male	29-35	28		27-28	28
Ra501-25	Female	-	-	-	-lipping	47
Ra501-26	Female	-	-	-	-	45
Ra501-27	Female	42-47	55plus	-	-	45
Ra501-28	Female			45		45
Ra501-29	Male	42-47	60	47		47
Ra502-1	Male	65-81	70			70
Ra502-2a	Female	26-29	28	-	28plus	28
Ra502-2b	Female	-	-	53	-	53

Average bone age of females in series = 41.9 years (N=14)

Average bone age of males in series = 41.9 years (N=13)

Overall average bone age = 41.9 years (N=27)



TABLE II  
SKELETONS ACCORDING TO SEX, VARIETY AND CULTURE PERIOD

<i>Number</i>	<i>Sex</i>	<i>Variety</i>	<i>Culture Period</i>
Ra501-4	Male	Iswanid	Terminal Archaic
Ra501-5	Female	?	Archaic
Ra501-6	Female	Iswanid	Terminal Archaic
Ra501-7	Male	Illinid	Medial Archaic
Ra501-8	Female	?	Archaic
Ra501-9	Male	?	Archaic
Ra501-11	Male	?	Archaic
Ra501-12	Male	Illinid	Medial Archaic
Ra501-13	Male	Iswanid	Medial Archaic
Ra501-14	Female	Iswanid	Terminal Archaic
Ra501-15	Female	Iswanid	Terminal Archaic
Ra501-16	Male	?	Archaic
Ra501-17	Male	Illinid	Medial Archaic
Ra501-18	Male	Iswanid	Medial Archaic
Ra501-19	Male	Modified Iswanid or Modified Otamid	Medial Archaic
Ra501-20	Male	Iswanid	Medial Archaic
Ra501-21	Female	Illinid	Medial Archaic
Ra501-22	Female	Lenid	Medial Archaic
Ra501-23	Female	Illinid	Medial Archaic
Ra501-24	Male	Illinid	Medial Archaic
Ra501-25	Female	Iswanid	Medial Archaic
Ra501-26	Female	?	Medial Archaic
Ra501-27	Female	Iswanid	Medial Archaic
Ra501-28	Female	Iswanid	Medial Archaic
Ra501-29	Male	Iswanid	Medial Archaic
Ra502-1	Male	?	Archaic
Ra502-2a	Female	?	Archaic
Ra502-2b	Female	?	Archaic

TABLE III  
SUMMARY OF PATHOLOGY AT MODOC ROCK SHELTER

	Burial No.	Skeletal Age	Sex	Diagnostic Impression
A. Anomalies in Growth and Development (hereditary and non-hereditary)	Ra501-17	68	Male	Spina bifida occulta
	Ra501-19	45	Male	Non-union of S <sub>1</sub> to remainder of sacrum. Manubrio-corporal union of sternum.
	Ra501-25	47	Female	Non-union of S <sub>1</sub> to remainder of sacrum. Incomplete development and failure of fusion of neural arch of upper cervical vertebrae.
	Ra502-1	70	Male	Manubrio-corporal union of sternum. Perforate sternum (failure of fusion of bi-lateral centers of ossification of sternebra No. 4).
B. Disorders of Metabolism				
		None in evidence		
C. Regressive Changes	Ra501-15	35	Female	Osteoporosis of disuse in bones of left upper extremity.
	Ra501-17	68	Male	Generalized osteoporosis.
	Ra502-1	70	Male	Generalized osteoporosis secondary to disuse.
D. Pathology of Traumatic Origin				
I. Fractures	Ra501-12	65	Male	(a) Healed traumatic fracture of distal 1/3 of right radius and ulna. (b) Healed depressed fracture of right zygomatic process of frontal bone. (c) Healed fracture of right clavicle.
	Ra501-15	35	Female	Pitting, atrophy and degeneration of head of left humerus compatible with trauma to shoulder prior to epiphyseal union.

TABLE III (Continued)

Burial No.	Skeletal Age	Sex	Diagnostic Impression
I. Fractures (Continued)			
Ra501-16	15	Male	Crushing injury with multiple fracture injuries to right foot.
Ra501-17	68	Male	Avulsion of triceps tendon from left ulna.
Ra501-18	45	Male	Healed traumatic fracture of distal end of left radius.
Ra501-19	45	Male	(a) Non-united, complete, traumatic fracture at mid-shaft of right radius. (b) Healed traumatic fracture of proximal half of left 5th metacarpal.
Ra501-20	35	Male	Well healed, united, traumatic fracture of mid-shaft of left humerus.
Ra501-24	28	Male	Healed depressed fracture of outer table of left parietal and frontal bones.
Ra501-4	47	Male	Marked osteoarthritis of thoracic vertebrae, ribs, left acromioclavicular joint, right triquetrum, right navicular and right tibia at knee joint.
Ra501-5	27	Female	(a) Moderate osteoarthritis of cervical spine. (b) Marked osteoarthritis of lumbar spine.
Ra501-6	32	Female	Moderate osteoarthritis of temporo-mandibular joints.
Ra501-7	20	Male	Moderate osteoarthritis of proximal end of right 4th metatarsal bone.
Ra501-8	18	Female	(a) Marked osteoarthritis of lumbar spine. (b) Moderate osteoarthritis of symphysis pubis.
Ra 501-9	"old"	Male	(a) Moderate to marked osteoarthritis of spine and ribs. (b) Marked osteoarthritis of right proximal ulna at elbow joint and at distal radio-ulnar joint.
II. Osteoarthritis			



Ra501-12	65	Male	<p>(a) Marked osteoarthritis of temporo-mandibular joints, vertebral column, claviculo-manubrial joints, ribs, acromio-clavicular joints, and left talo-navicular and calcaneo-cuboidal joints.</p> <p>(b) Moderate to marked osteoarthritis is also present elsewhere in the skeleton.</p> <p>(c) Marked osteoarthritis at right wrist joint secondary to fracture of distal radius and ulna.</p>
Ra501-13	42	Male	Moderate osteoarthritis of lumbar spine.
Ra501-14	65	Female	<p>(a) Moderate to marked osteoarthritis of cervical, thoracic and lumbar spine.</p> <p>(b) Marked osteoarthritis of proximal interphalangeal joint of right thumb.</p>
Ra501-15	35	Female	<p>Marked osteoarthritis of right temporo-mandibular joint (left missing) and left shoulder joint.</p> <p>Moderate osteoarthritis of right acetabulum.</p>
Ra501-16	15	Male	Moderate osteoarthritis of right first tarso-metatarsal joint.
Ra501-17	68	Male	<p>(a) Moderate to marked osteoarthritis of cervical and lumbar spine.</p> <p>(b) Marked osteoarthritis of medial aspect of olecranon process of left ulna (secondary to avulsion of triceps tendon).</p> <p>(c) Marked osteoarthritis of proximal interphalangeal joint of right index finger and medial 1/2 of right patella.</p>
Ra501-18	45	Male	<p>(a) Marked osteoarthritis at articular processes of cervical vertebrae.</p> <p>(b) Moderate to marked osteoarthritis of lumbar spine.</p> <p>(c) Marked osteoarthritis of acromio-clavicular joints and left distal radius and ulna.</p>

TABLE III (Continued)

Burial No.	Skeletal Age	Sex	Diagnostic Impression
II. Osteoarthritis (Continued)			
Ra501-19	45	Male	Moderate to marked osteoarthritis throughout skeleton. Very marked involvement in lumbar and sacral spine. Marked osteoarthritis in pseudoarthrosis in mid-shaft of right radius.
Ra501-20	35	Male	Moderate to marked osteoarthritis of lumbar spine, ribs, and symphysis pubis.
Ra501-24	28	Male	Mild to moderate osteoarthritis of cervical and lumbar spine.
Ra501-25	47	Female	(a) Marked osteoarthritis of lumbar spine. (b) Moderate osteoarthritis of ribs, right radius and ulna (proximal radio-ulnar joint and distal radius).
Ra501-26	45	Female	Moderate to marked osteoarthritis of proximal radius and ulna bilaterally.
Ra501-27	45	Female	(a) Marked osteoarthritis of lumbar spine. (b) Moderate to marked osteoarthritis of ribs, right acromio-clavicular joint, left proximal radius, right proximal ulna, right metatarsal phalangeal joints, and 3rd proximal right interphalangeal joint of foot.
Ra501-28	45	Female	Moderate osteoarthritis at symphysis pubis.
Ra501-29	47	Male	(a) Marked osteoarthritis of cervical and lumbar spine. (b) Moderate osteoarthritis of thoracic spine. (c) Moderate to marked osteoarthritis present in left acromio-clavicular, claviculo-manubrial, manubrio-corporal, xiphoid, ribs, shoulders, both upper extremities, sacroiliac joints, symphysis pubis, and 1st metatarsophalangeal joints.

Ra502-1	70	Male	(a) Moderate osteoarthritis of upper 2 thoracic vertebrae 1 and 2, ribs, claviculo-manubrial joint, right glenoid fossa, right proximal ulna and interphalangeal joints of upper extremities. (b) Moderate osteoarthritis of symphysis pubis, left acetabulum both knee joints (femur and tibia), left proximal tibio-fibular joint, and right and left metatarso-phalangeal joints.
Ra502-2a	28	Female	Moderate osteoarthritis of lower thoracic and lumbar spine and 5th right metacarpo-phalangeal joint.
Ra502-2b	53	Female	Marked osteoarthritis of articular facets of lumbar vertebra No. 4 and anterior edge of symphysis pubis.
<b>E. Inflammatory and Granulomatous Lesions</b>			
Ra501-15	35	Female	Osteomyelitis of middle one third of shaft of right tibia.
Ra501-26	45	Female	Osteitis of proximal ulnae and greater trochanter of left femur.
Ra502-1	70	Male	Severe osteomyelitis of distal and middle portions of right and left femora.
<b>F. Neoplastic Disease</b>			
Ra501-19	45	Male	Hemangioma in body of lumbar vertebra No. 2.
Ra501-20	35	Male	Benign tumor producing erosion in floor of acetabulum of left innominate bone.
Ra502-2a	28	Female	Osteoma of left frontal bone.
<b>G. Neuropathic Lesions</b>			
			None in evidence

TABLE III (Concluded)

	Burial No.	Skeletal Age	Sex	Diagnostic Impression
H. Lesions Secondary to Disorders of Circulation				
		None in evidence		
I. Bone Changes Secondary to Hematologic Disease				
		None in evidence		
J. Idiopathic or Diseases of Unknown Cause	Ra502-1	70	Male	Rheumatoid spondylitis (Marie-Strümpell disease).
K. Dental Pathology				
	Ra501-4	47	Male	Marked periodontoclasia.
	Ra501-12	65	Male	Marked periodontoclasia.
	Ra501-15	35	Female	Moderate periodontoclasia.
	Ra501-17	68	Male	(a) Very marked periodontoclasia, dental attrition and loss of all upper teeth. (b) Marked alteration of upper palate and floor of nasal cavity secondary to (a).
	Ra501-18	45	Male	(a) Marked periodontoclasia. (b) Alveolar abscess above 1st and 2nd left permanent molars and in left mandible. (c) Marked dental attrition.
	Ra501-19	45	Male	(a) Marked periodontoclasia. (b) Marked pre-mortem tooth loss.
	Ra501-23	70	Female	(a) Marked periodontoclasia. (b) Marked pre-mortem tooth loss.
	Ra501-29	47	Male	(a) Alveolar abscess of left maxilla. (b) Marked dental attrition and loss of teeth pre-mortem.
L. No Bone Pathology in Evidence				
	Ra501-11	18	Male	
	Ra501-21	73	Female	(Burial consists of skull only)

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IslandSite Modoc Rock Shelter  
Culture Terminal Archaic  
Antiquity 2765 B.C. ± 300No. Ra501-4  
Physiological Age 47Age: Suture 42-47  
Dental 50Epiphyseal \_\_\_\_\_  
Symphyseal (pubic) \_\_\_\_\_

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		2	2	Wrist		
Occipito-cervical		1	-	Radius	-	-
Intervertebral		Cervical	Thoracic	Ulna	-	-
			Lumbar	Carpals	See descriptive notes	
1	2	Fragments of	-	Carpo-metacarpal	"	"
2	3	thoracic vertebrae	-	Metacarpo-phalangeal	"	"
3	-	show up to stage	-	Interphalangeal	"	"
4	-	4 lipping. Inter-	-	Proximal	"	"
5	-	vertebral articu-	-	Distal	"	"
6	-	lating facets - 2		Sacro-iliac	-	-
7	-			Symphysis pubis	-	-
8				Hip		
9				Acetabulum	1	0
10				Head of femur	0	0
11				Knee		
12				Femur	2	3
Sacral -				Tibia	4	-
Coccygeal -				Patella	-	-
Claviculo-manubrial		-	-	Tibio-fibular		
Manubrio-corporal		-	-	Proximal	-	-
Xiphoid		-	-	Distal	1	0
Costal				Ankle joints		
Head		4-5	4-5	Tibio-talar	-	0
Costal-chondral		-	-	Intertarsal	2 (navicular=3)	2 (navicular=3)
Shoulder				Tarso-metatarsal	2	-
Acromio-clavicular		-	5	Metatarsal-phalangeal	-	-
Glenoid fossa		-	-	Interphalangeal		
Head of humerus		-	-	Proximal	-	-
Elbow				Distal	-	-
Humerus		-	1			
Radius		-	0			
Ulna		-	2			
Radio-ulnar						
(Proximal)		-	2(ulna)			
(Distal)		-	-			
				* for explanation see text. - = not available for study.		

## DESCRIPTIVE NOTES:

Lower left first permanent molar lost pre-mortem. Pronounced resorption of bone of alveolar margins of mandible. Similar findings in area of right permanent molars 1, 2, & 3. Molars 2 & 3 lost pre-mortem and bone resorbed and healed over. Incisors, canines, and premolars lost from palate pre-mortem.

Fragments of bodies of thoracic vertebrae show up to stage 4 osteophytosis. Cervical vertebrae 2 & 3 show minor osteoarthritic change. Heads of ribs exhibit stages 4 & 5 involvement with osteoarthritis.

Left acromio-clavicular joint shows stage 5 osteoarthritic change (right missing). In the wrist, the right lunate exhibits stage 5 osteophytosis and erosion at its articulation with the radius. The right navicular presents stage 5 osteophytosis and pitting on its anterior lateral aspect. The right triquetrum shows stage 5 pitting and lipping on its posterior aspect. The right tibia exhibits stage 4 osteoarthritic involvement at the knee joint.

Right lunate: 5 (at articulation with radius)

Right navicular: 5 (Anterior lateral aspect) (stage 2 at articulation with greater multangular)

Right hamate: 2

Right Cr. multangular: 1

Right triquetrum: 5 (posterior aspect)

Right metacarpals: -

Right metacarpal phalangeal: 1

Right middle phalanges: 1 (proximally and distally)

Right distal phalanges: 3

Left carpal missing (-)

Left metacarpals missing (-)

Left metacarpo-phalangeal: 1 (one phalanx)

Left middle phalanges: 1 (proximally & distally, one only)

Left distal phalanges: - (missing)

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex female  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra501-5  
Physiological Age 27Age: -  
Suture 26-29  
Dental -Epiphyseal 27-28  
Symphysial (pubic) 24-27

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		-	-	Wrist		
Occipito-cervical		-	-	Radius		-
Intervertebral:				Ulna		0
Cervical				Carpals		1
Thoracic				Carpometacarpal		1
Lumbar				Metacarpophalangeal		1
1	-	1	3(ant. surf. L2)	Interphalangeal		
2	-	-	4( " " " )	Proximal		0
3	-	1	5( L4 )	Distal		-
4	-	0	1	Sacro-iliac		0
5	3	0	1	Symphysis pubis		2
6	3	0		Hip		
7	2	0		Acetabulum		1
8		0		Head of femur		-
9		0		Knee		
10		0		Femur		1
11		0		Tibia		0
12		0		Patella		0
2(ant. surf. of body)				Tibio-fibular		
Sacral -				Proximal		-
Coccygeal -				Distal		1
Claviculo-manubrial		0	0	Ankle joints		
Manubrio-corporal		A		Tibio-talar		0
Xiphoid		-		Invertarsal		1
Costal				Tarsometatarsal		0
Head		1	1	Metatarsal-phalangeal		0(2nd=2 on prox phalanx)
Costal-chondral		2	2	Interphalangeal		
Shoulder				Proximal		0
Acromio-clavicular		-	0	Distal		1
Glenoid fossa		-	-			
Head of humerus		1	1			
Elbow						
Humerus		0	0			
Radius		-	-			
Ulna		1	1			
Radio-ulnar						
(Proximal)		2	2			
(Distal)		0	0			

## DESCRIPTIVE NOTES:

Lower cervical intervertebral joints show moderate osteoarthritic change. Lumbar intervertebral joints 1, 2, and 3 exhibit medium to very pronounced erosion and osteoarthritic lipping.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety IslandSite Modoc Rock Shelter  
Culture Terminal Archaic  
Antiquity 2765 B.C. ± 300No. R0501-6  
Physiological Age 32Age:                       
Suture 29-35  
Dental 30Epiphyseal -  
Symphyseal (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		3	3	Wrist		
Occipito-cervical		-	-	Radius	-	-
Intervertebral	Cervical		Thoracic	Ulna	-	-
			Lumbar	Carpals	-	-
1				Carpo-metacarpal	-	-
2				Metacarpo-phalangeal	-	-
3				Interphalangeal		
4	--	--	--	Proximal	-	-
5				Distal	-	-
6				Sacro-iliac	-	-
7				Symphysis pubis	-	-
8				Hip		
9				Acetabulum	-	-
10				Head of femur	-	-
11				Knee		
12				Femur	-	-
Sacral -			-	Tibia	-	-
Coccygeal -				Patella	-	-
Claviculo-manubrial		-		Tibio-fibular		
Manubrio-corporal -				Proximal	-	-
Xiphoid -				Distal	-	-
Costal				Ankle joints		
Head	-	-	-	Tibio-talar	-	-
Costal-chondral	-	-	-	Interatarsal	-	-
Shoulder				Tarso-metatarsal	-	-
Acromio-clavicular	-	-	-	Metatarsal-phalangeal	1(see descriptive notes)	-
Glenoid fossa	1	-	-	Interphalangeal		
Head of humerus	-	-	-	Proximal	-	-
Elbow				Distal	-	-
Humerus	-	-	-			
Radius	-	-	-			
Ulna	-	-	-			
Radio-ulnar (Proximal)	-	-	-			
(Distal)	-	-	-			

## DESCRIPTIVE NOTES:

Remains incomplete, consisting only of fragments of skull, right scapula, right clavicle, and one proximal phalanx of right foot. Temporo-mandibular joints show a medium degree of osteoarthritic change.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IlliniidSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 3325 B.C. - F. 300No. Ra501-7  
Physiological Age 20Age: Suture -22  
Dental 19Epiphyseal 19  
Symphysial (pubic) -

JOINT		RIGHT		LEFT		JOINT		RIGHT		LEFT	
Temporo-mandibular		1		1		Wrist					
Occipito-cervical		1		1		Radius		-		-	
Intervertebral:	Cervical					Ulna		0		0	
	1	0		0		Carpals		1		1	
	2	0		0		Carpo-metacarpal		0		0	
	3	0		0		Metacarpo-phalangeal		0		1	
	4	0		0		Interphalangeal					
	5	2		0		Proximal		-		1	
	6	1		0		Distal		-		1	
	7	1		0		Sacro-iliac		1		1	
	8			0		Symphysis pubis		-		-	
	9			0		Hip					
	10			0		Acetabulum		0		2(posteriorly)	
	11			0		Head of femur		0		0	
	12			0		Knee					
Sacral 1		RIGHT		LEFT		Femur		1		0	
Coccygeal -						Tibia		0		0	
Claviculo-manubrial		-		1		Patella		0		1	
Manubrio-corporal -						Tibio-fibular					
Xiphoid 0						Proximal		-		0	
Costal						Distal		-		0	
Head		1		1		Ankle joints					
Costal-chondral		1		1		Tibio-talar		-		1	
Shoulder						Interatarsal		1		2	
Acromio-clavicular		0		0		Tarso-metatarsal		2		1	
Glenoid fossa		1		0		Metatarsal-phalangeal		2(see descriptive notes)		2	
Head of humerus		0		0		Interphalangeal					
Elbow						Proximal		2		2	
Humerus		-		0		Distal		-		2	
Radius		-		0							
Ulna		1		0							
Radio-ulnar											
(Proximal)		-		1							
(Distal)		-		-							

## DESCRIPTIVE NOTES:

Right fourth metatarsal exhibits a large medial spur of bone at its proximal end.



## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra501-8  
Physiological Age 18Age: -  
Suture -  
Dental -Epiphyseal -18  
Symphyseal (pubic) -

JOINT	RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular	-	-	Wrist		
Occipito-cervical	-	-	Radius	0	-
Intervertebral:	Cervical	Thoracic	Ulna	-	0
1	0	--	Carpals	0	0
2	-	(see descriptive notes)	Carpo-metacarpal	0	0
3	-		Metacarpo-phalangeal	0	0
4	-		Interphalangeal		
5	-		Proximal	0	0
6	-		Distal	0	0
7	-		Sacro-iliac	1	0
8			Symphysis pubis	3 (posterior edge)	3
9			Hip		
10			Acetabulum	0	1
11			Head of femur	0	0
12			Knee		
Sacral 0			Femur	0	0
Coccygeal -			Tibia	0	0
Claviculo-manubrial	0	0	Patella	0	0
Manubrio-corporal -			Tibio-fibular		
Xiphoid -			Proximal	-	-
Costal			Distal	0	0
Head -			Ankle joints		
Costal-chondral -			Tibio-talar	0	0
Shoulder			Intertarsal	0	1
Acromio-clavicular	-	0	Tarso-metatarsal	1	1
Glenoid fossa -	-	-	Metatarsal-phalangeal	-	1
Head of humerus -	-	-	Interphalangeal		
Elbow			Proximal	-	-
Humerus	0	0	Distal	-	1 (Gr. toe only)
Radius	0	0			
Ulna	2	1			
Radio-ulnar					
(Proximal)	0	0			
(Distal)	-	0			

## DESCRIPTIVE NOTES:

Fragments of lumbar vertebrae show stage 4 osteophytosis. Lumbosacral joint shows stage 4 osteoarthritic involvement. Symphysis pubis exhibits stage 3 osteoarthritic involvement.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra501-9  
Physiological Age oldAge: -  
Suture -  
Dental -Epiphyseal -  
Symphyseal (pubic) -

JOINT				JOINT		
RIGHT				RIGHT		
LEFT				LEFT		
Temporo-mandibular				Wrist		
Occipito-cervical				Radius	-	-
Intervertebral:				Ulna	-	-
Cervical		Thoracic	Lumbar	Carpals	2	-
1	--	--	(see descr. notes)	Carpo-metacarpal	-	-
2				Metacarpo-phalangeal	2	1
3				Interphalangeal		
4				Proximal	-	1
5				Distal	1(thumb)	-
6				Sacro-iliac	-	-
7				Symphysis pubis	-	-
8				Hip		
9				Acetabulum	3(posterior lip)	-
10				Head of femur	-	-
11				Knee		
12				Femur	-	-
Sacral -				Tibia	-	2
Coccygeal 1				Patella	-	2(pitting on lat. artic- ular surf.)
Claviculo-manubrial	-	-		Tibio-fibular		
Manubrio-corporal -				Proximal	-	-
Xiphoid -				Distal	1	1
Costal				Ankle joints		
Head -				Tibio-talar	1	-
Costal-chondral	4(one rib)	-		Intertarsal	2	2
Shoulder				Tarso-metatarsal	-	1
Acromio-clavicular	-	-		Metatarsal-phalangeal	0	1
Glenoid fossa	-	-		Interphalangeal		
Head of humerus	-	-		Proximal	-	-
Elbow				Distal	-	-
Humerus	-	3				
Radius	-	-				
Ulna	4	-				
Radio-ulnar						
(Proximal)	-	-				
(Distal)	4(ulna)	-				

## DESCRIPTIVE NOTES:

One lumbar vertebra exhibits stage 3 lipping on its body. Fragments of a second and third vertebral body show stage 4 lipping. One rib fragment shows pronounced osteoarthritic involvement.

Right ulna shows stage 4 osteoarthritic change at elbow joint. Stage 4 osteoarthritis also present at distal radio-ulnar joint. Posterior lip of right acetabulum shows stage 3 lipping. The left acetabulum is missing.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra501-11  
Physiological Age 18Age: -  
Suture -  
Dental -Epiphyseal 18  
Symphysial (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		-	-	Wrist		
Occipito-cervical		-	-	Radius	-	-
Intervertebral:				Ulna	-	-
1	Cervical		0	Carpals	0 (lunate only)	-
2			0	Carpo-metacarpal	0 (thumb only)	0 (thumb only)
3			0	Metacarpo-phalangeal	-	-
4	--	--	0	Interphalangeal		
5			0	Proximal	-	-
6				Distal	-	-
7				Sacro-iliac	-	-
8				Symphysis pubis	-	-
9				Hip		
10				Acetabulum	-	0
11				Head of femur	-	0
12				Knee		
Sacral -				Femur	2	1
Coccygeal -				Tibia	0	0
Claviculo-manubrial		-	-	Patella	1	-
Manubrio-corporal		0		Tibio-fibular		
Xiphoid		-		Proximal	0	0
Costal				Distal	-	0
Head		1	-	Ankle joints		
Costal-chondral		-	-	Tibio-talar	-	0
Shoulder				Intertarsal	-	1 (tal <sup>0</sup> -calcaneal only)
Acromio-clavicular		-	-	Tarso-metatarsal	-	
Glenoid fossa		-	0	Metatarsal-phalangeal	1 (Gr. toe only)	-
Head of humerus		-	1	Interphalangeal		
Elbow				Proximal	-	-
Humerus		1	1	Distal	-	-
Radius		0	0			
Ulna		-	1			
Radio-ulnar						
(Proximal)		1	1			
(Distal)		-	-			

## DESCRIPTIVE NOTES:

No significant pathology indicated in skeleton

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety BlindSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 3325 B.C. ± 300No. Ra501-12  
Physiological Age 65Age: Suture 51-65  
Dental 65+Epiphyseal -  
Symphyseal (pubic) -

JOINT		RIGHT		LEFT		JOINT	RIGHT	LEFT
Temporo-mandibular		5		5		Wrist		
Occipito-cervical		2		2		Radius	see descrip. notes)	2
Intervertebral		Cervical		Thoracic		Ulna		2
1	-	2 thoracic verte-		-		Carpals	1	-
2	-	bra show stage 4		5		Carpo-metacarpal	1	1
3	4			5		Metacarpophalangeal	1	1
4	4			5		Interphalangeal		
5	4			5		Proximal	-	1
6	3					Distal	-	-
7	3					Sacro-iliac	3(pitting)	-
8						Symphysis pubis	-	-
9						Hip		
10						Acetabulum	-	-
11						Head of femur	-	-
12						Knee		
Sacral -		RIGHT		LEFT		Femur	-	-
Coccygeal -						Tibia	-	-
Claviculo-manubrial		4		4		Patella	-	-
Manubrio-corporal		-				Tibio-fibular		
Xiphoid		-				Proximal	-	-
Costal						Distal	-	-
Head		4		4		Ankle joints		
Costal-chondral		5		5		Tibio-talar	-	*see descrip.
Shoulder						Intertarsal	1	" notes
Acromio-clavicular		5(clavicle)		3		Tarso-metatarsal	0	"
Glenoid fossa		3		2		Metatarsal-phalangeal	2(great toe)	"
Head of humerus		-		-		Interphalangeal		
Elbow						Proximal	-	"
Humerus		3		3		Distal	-	"
Radius		-		0				
Ulna		3		3				
Radio-ulnar		-		-				
(Proximal)		-		-				
(Distal)		see descrip. notes)		1				

## DESCRIPTIVE NOTES:

All teeth in mandible from left permanent molar 3 through right permanent molar 1 were lost pre-mortem. Alveolar margins show considerable resorption. Condition of right permanent molars 2 and 3 undeterminable due to breakage and loss. Right zygomatic process of frontal bone exhibits healed depressed fracture.

Right and left temporo-mandibular joints show stage 5 osteoarthritic change involving both temporal bone and mandible. Rather pronounced osteoarthritis is indicated in the vertebral column as well as in the right and left claviculo-manubrial joints, ribs, and acromio-clavicular joints. Moderate osteoarthritic change is to be noted elsewhere in the skeleton. The left clavicle shows a well healed fracture in its middle third.

Distal one third and distal one fifth of right ulna and radius respectively, show pathology characteristic of a healing traumatic fracture. The wrist joint at the right distal ulna exhibits stage 4 erosion. The wrist joint at the right radius presents stage 5 erosion and osteophytosis (probably osteoarthritis secondary to the fracture). The right acromion process shows pitting and atrophy along its lateral margin. The Talo-navicular and calcaneo-cuboidal joints of the left foot exhibit stage 5 osteophytosis and pitting.

## \*Left foot:

Posterior talo-calcaneal	2
Anterior "	3
Talo-navicular	5(esp. navicular)
Calcaneo-cuboidal	5(calcaneous)
3rd cuneiform	1
2nd "	-
1st "	1
Cuboid	-
Tarso-metatarsal	1

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IswanidSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 3325 B.C. ± 300No. Ra501-13  
Physiological Age 42Age: Suture 42-47  
Dental 40Epiphyseal -  
Symphysial (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		1	1	Radius		
Intervertebral	Cervical			Ulna		
				Carpals		
1	2	1	3	Carpo-metacarpal		
2	1	1	3	Metacarpophalangeal		
3	1	2	3	Interphalangeal		
4	1	1	-	Proximal		
5	2	1	-	Distal		
6	1	1		Sacro-iliac		
7	1	1		Symphysis pubis		
8		1		Hip		
9		1		Acetabulum		
10		2		Head of femur		
11		1		Knee		
12		2		Femur		
Sacral -				Tibia		
Coccygeal -				Patella		
Claviculo-manubrial		0	0	2(on lateral side)		
Manubrio-corporal		-	-	Tibio-fibular		
Xiphoid -				Proximal		
Costal				Distal		
Head		1	-	Ankle joints		
Costal-chondral		-	-	Tibio-talar		
Shoulder				Intertarsal		
Acromio-clavicular		-	-	Tarso-metatarsal		
Glenoid fossa		-	-	Metatarsal-phalangeal		
Head of humerus		-	-	Interphalangeal		
Elbow				Proximal		
Humerus		0	0	Distal		
Radius		0	0			
Ulna		-	2			
Radio-ulnar		-				
(Proximal)		-	1			
(Distal)		-	-			

## DESCRIPTIVE NOTES:

A moderate osteoarthritis of the lumbar spine is present.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety IswanidSite Modoc Rock Shelter  
Culture Terminal Archaic  
Antiquity 2765 B.C. ± 300No. Ra501-14  
Physiological Age 65Age: Suture 65-81  
Dental 65+Epiphyseal -  
Symphyseal (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		2	2	Radius		2
Intervertebral:		Cervical	Thoracic	Ulna		2
1		2	-	Carpals		-
2		-	-	Carpo-metacarpal		1
3		-	-	Metacarpo-phalangeal		3
4		-	-	Interphalangeal		
5		-	-	Proximal		-
6		-	-	Distal		-
7		-	-	Sacro-iliac		-
8		-	-	Symphysis pubis		-
9		-	-	Hip		
10		-	-	Acetabulum		-
11		-	-	Head of femur		0
12		-	-	Knee		
Sacral -		RIGHT	LEFT	Femur		-
Coccygeal -				Tibia		2
Claviculo-manubrial		-	-	Patella		-
Manubrio-corporal -				Tibio-fibular		
Xiphoid -				Proximal		-
Costal				Distal		-
Head		-	-	Ankle joints		
Costal-chondral		2	2	Tibio-talar		2
Shoulder				Intertarsal		3
Acromio-clavicular		-	-	Tarso-metatarsal		3
Glenoid fossa		1	-	Metatarsal-phalangeal		2
Head of humerus		-	2	Interphalangeal		
Elbow				Proximal		2
Humerus		1	0	Distal		-
Radius		0	0			
Ulna		2	-			
Radio-ulnar						
(Proximal)		-	2			
(Distal)		1	1			

## DESCRIPTIVE NOTES:

Fragments of cervical and thoracic vertebrae indicate osteoarthritic involvement. Fragments of lumbar vertebrae show stage 5 osteophytosis. Proximal interphalangeal joint of right thumb exhibits stage 4 osteophytosis, erosion and eburnization on the inferior lateral aspect of the joint.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety IswanidSite Modo: Rock Shelter  
Culture Terminal Archaic  
Antiquity 2765 B.C. ± 300No. Ra501-15  
Physiological Age 35Age: Suture 35-38  
Dental 35Epiphyseal -  
Symphysial (pubic) -

JOINT		RIGHT		LEFT		JOINT		RIGHT		LEFT	
Temporo-mandibular		5		-		Wrist					
Occipito-cervical		2		2		Radius		-		-	
Intervertebral:		Cervical		Thoracic		Ulna		-		-	
						Carpals		1		1	
1		2(odontoid		0		-					
2		1 fossa		0		-		Carpo-metacarpal		-	
3		2 also		-		-				-	
4		3 stage 2)		-		-		Metacarpo-phalangeal		-	
5		2		-		3(lumbo-sacral)					
6		2		-				Interphalangeal			
7		2		-				Proximal		1	
8				-				Distal		1	
9				-							
10				-				Sacro-iliac		3	
11				-							
12				-				Symphysis pubis		-	
		RIGHT		LEFT							
Sacral -						Hip					
Coccygeal -						Acetabulum		3(post. inferior surf.		2	
Claviculo-manubrial		-		-		Head of femur		1 of acetabular notch)		1	
Manubrio-corporal -						Knee					
Xiphoid -						Femur		1		1	
Costal						Tibia		0		0	
Head 2						Patella		-		1	
Costal-chondral		-		-		Tibio-fibular					
Shoulder						Proximal		-		-	
Acromio-clavicular		2		-		Distal		-		-	
Glenoid fossa		1		5*		Ankle joints					
Head of humerus		-		5*		Tibio-talar		0(talo-calcaneal		0	
Elbow						Intertarsal		2 shows stage 2)		2	
Humerus		-		0		Tarso-metatarsal		1		1	
Radius		-		1		Metatarsal-phalangeal		1		1	
Ulna		-		2		Interphalangeal		-		-	
Radio-ulnar						Proximal		-		-	
(Proximal)		-		1		Distal		-		-	
(Distal)		2		1							

## DESCRIPTIVE NOTES:

\* Joint shows pronounced atrophy.

The right temporo-mandibular joint exhibits stage 5 osteoarthritic change. The alveolar margins of the mandible show considerable resorption. The head of the left humerus and glenoid fossa show extensive pitting, roughness, atrophy and marked degenerative changes. All the bones of the left arm are quite small, light in weight and fragile.

The posterior inferior surface of the right acetabular notch presents stage 3 lipping. Evidence of osteomyelitis is present in the middle one third of the shaft of the right tibia.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra501-16  
Physiological Age 15Age: - Suture -  
Dental -Epiphyseal 15-16  
Symphysial (pubic) -

JOINT	RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular	-	-	Wrist		
Occipito-cervical	-	-	Radius	-	-
Intervertebral:			Ulna	-	-
1	-	-	Carpals	-	-
2	-	-	Carpo-metacarpal	-	-
3	-	-	Metacarpo-phalangeal	-	-
4	-	-	Interphalangeal		
5	-	-	Proximal	-	-
6	-	-	Distal	-	-
7	-	-	Sacro-iliac	-	-
8	-	-	Symphysis pubis	-	-
9	-	-	Hip		
10	-	-	Acetabulum	-	0
11	-	-	Head of femur	-	-
12	-	-	Knee		
Sacral -			Femur	1	-
Coccygeal -			Tibia	1	-
Claviculo-manubrial	-	-	Patella	-	0
Manubrio-corporal -			Tibio-fibular		
Xiphoid -			Proximal	1	-
Costal			Distal	0	-
Head	-	-	Ankle joints		
Costal-chondral	-	-	Tibio-talar	1	-
Shoulder			Intertarsal	-	0
Acromio-clavicular	-	-	Tarso-metatarsal	see descr. notes	0
Glenoid fossa	-	-	Metatarsal-phalangeal	"	1(Gr. toe=2)
Head of humerus	-	-	Interphalangeal		
Elbow			Proximal	"	1(2nd middle phalanx
Humerus	-	-	Distal		1 " " " only)
Radius	-	-			
Ulna	-	1			
Radio-ulnar					
(Proximal)	-	0			
(Distal)	-	-			

## DESCRIPTIVE NOTES:

Skeletal remains quite fragmentary. 1st right metatarsal shows stage 3 osteoarthritic change at proximal end (tarso-metatarsal joint). Several bones of right foot exhibit evidence of traumatic nature (crushing injury?). (see below)

## right foot:

1st metatarsal  
Proximal phalanx of 1st toe  
Proximal phalanx of 2nd toe  
3rd metatarsal  
5th metatarsal

3 proximally, 1 distally  
2 proximally, traumatic lesion distally  
2 proximally, traumatic lesion distally  
1 proximally & distally  
1 proximally, traumatic lesion distally



## OBSERVATION BLANK FOR OSTEOPATHIOLOGY

Sex Male  
Variety IliindSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 3657 B.C. ± 164  
to 5044 B.C. ± 150No. Ra501-17  
Physiological Age 68Age: \_\_\_\_\_  
Suture - \_\_\_\_\_  
Dental - \_\_\_\_\_Epiphyseal - \_\_\_\_\_  
Symphysial (pubic) 50\* (68)

JOINT		RIGHT	LEFT	JOINT		RIGHT	LEFT
Temporo-mandibular		0	0	Wrist			
Occipito-cervical		-	-	Radius		1	1
Intervertebral:		Cervical	Thoracic	Ulna		1	0
				Carpals		1(2 on hamate)	1
1	-	1	3	Carpo-metacarpal		1	1
2	-	1	4	Metacarpophalangeal		1	1
3	-	1	4				
4	-	1	3*	Interphalangeal			
5	4	2	2*	Proximal		1(4 on index	1
6	4(pitting)	2	*upper surface of bodies of vert. more severely involved.	Distal		1 finger)	1
7	1(pitting)	1		Sacro-iliac		2	2
8		1		Symphysis pubis		2	2
9		1		Hip			
10		1		Acetabulum		2	2
11		1	Head of femur		0	0	
12		1	Knee				
Sacral 3 (fragments of sacrum also indicate spina bifida)		RIGHT		Femur		0	0
		LEFT		Tibia		1	0
Coccygeal 0				Patella		4(medial 1/2)	1
Claviculo-manubrial		1	-	Tibio-fibular			
Manubrio-corporal 1				Proximal		0	-
Xiphoid 4				Distal		1	-
Costal				Ankle joints			
Head 1		(right and left not determined)		Tibio-talar		1	0
Costal-chondral 3		( " " " " " )		Intertarsal		2	2
Shoulder				Tarso-metatarsal		1	1
Acromio-clavicular		2	3	Metatarsal-phalangeal		0(2 on Gr.toe)	-
Glenoid fossa		3	1	Interphalangeal			
Head of humerus		2	0	Proximal		0	1
Elbow				Distal		0(1 on Gr.toe)	1
Humerus		1	1				
Radius		2	1				
Ulna		1	4(see descr. notes)				
Radio-ulnar							
(Proximal)		0	0				
(Distal)		1	0				

## DESCRIPTIVE NOTES:

Pronounced peridontoclasia seen in mandible. Teeth show pronounced attrition. Left permanent molars lost pre-mortem and alveolar bone shows considerable resorption and recession. All upper teeth lost pre-mortem and floor of nasal cavity and upper palate modified due to dental pathology.

Cervical intervertebral joints 5 and 6 exhibit stage 4 pitting on articular surfaces of vertebral bodies. Lumbar vertebrae show medium to pronounced osteoarthritic changes. The upper surfaces of the vertebral bodies are more severely involved than the lower. Fragments of the sacrum indicate the presence of a spina bifida occulta condition.

The region of the insertion of the triceps tendon on the olecranon process of the left ulna is very pitted, roughened and irregular. Little inflammatory change and no significant necrotic bone are present. Only a small amount of new bone formation is present. Secondary osteoarthritic changes are present on the medial aspect of the joint. The remainder of the joint presents only a stage 2 osteoarthritic involvement. The humerus and radius were apparently uninvolved. The proximal interphalangeal joint of the right index finger shows stage 4 osteoarthritis.

Stage 4 pitting and osteophytosis are present on the medial half of the right patella. A senile osteoporosis is indicated in the light weight and generalized cortical thinning throughout the skeleton.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IswanidSite Modoc Rock Shelter  
Culture Medieval Archaic  
Antiquity 3325 B.C.  $\pm$  300No. Ra501-18  
Physiological Age 45Age: Suture 42-47  
Dental 55Epiphyseal -  
Symphysial (pubic) 40-45

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		1	1	Radius		1
Intervertebral:				Ulna		3
				Carpals		1
				Carpometacarpal		1
				Metacarpophalangeal		1
				Interphalangeal		
				Proximal		1
				Distal		2
				Sacro-iliac		2
				Symphysis pubis		-
				Hip		
				Acetabulum		1
				Head of femur		1
				Knee		
				Femur		2
				Tibia		2
				Patella		4 (osteophyte on inf. medial aspect)
				Tibio-fibular		
				Proximal		-
				Distal		1
				Ankle joints		
				Tibio-talar		0
				Intertarsal		1
				Tarsometatarsal		1
				Metatarsal-phalangeal		1
				Interphalangeal		
				Proximal		-
				Distal		1 (Gr. toe)

## DESCRIPTIVE NOTES:

Large alveolar abscess present in area of left permanent upper premolars 1 and 2 and left permanent molar 1. Teeth show pronounced degree of attrition. Abscess also present in left mandible. Alveolar margins are considerably resorbed.

Articular processes of cervical vertebrae exhibit pronounced osteoarthritic change while bodies of these vertebrae show only stage 1 and 2 involvement. Lumbar intervertebral joint no. 1 shows stage 4 lipping of bone on right anterior surface of body.

Lumbar intervertebral joint no. 3 exhibits stage 2 osteoarthritis involving the vertebral bodies, and stage 3 on the superior and inferior articular facets. Stage 5 pitting and erosion is present on the superior surface of lumbar vertebra no. 4 to the left of the left superior articular process. Lumbar intervertebral joint no. 4 presents stage 2 (slight) osteoarthritic change on the vertebral bodies at their articulation. The inferior articular facets of lumbar vertebra no. 4 show stage 4 on the left side and stage 3 osteoarthritis on the right side. The fifth lumbar vertebra exhibits stage 3 osteoarthritic change on its superior and inferior articular processes.

Both the right and left acromio-clavicular joints show stage 4 pitting and erosion. The left ulna of this skeleton exhibits pitting and erosion on the anterior surface of its distal end. Erosion and pitting are also present on the distal end of the left ulna. The styloid process of this ulna is considerably eroded and atrophied. The distal end of the left radius shows very pronounced osteophytosis and erosion probably due secondarily to healed traumatic fracture of distal end of this bone. Pronounced pitting and erosion (also probably secondary to fractured radius) are present at the left radio-ulnar articulation. The left clavicle exhibits erosion and pitting in the area of the attachment of the costoclavicular ligament.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male Site Modoc Rock Shelter No. Ra501-19  
 Variety Modified Iswandu or Culture Medial Archaic Physiological Age 45  
Modified Otomid Antiquity 3325 B.C. ± 300  
 Age: Suture - Epiphysal -  
 Dental - Symphysal (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		2	2	Radius		3
Intervertebral:				Ulna		3
Cervical				Carpals		(see descr. notes)
1	3(odontoid fossa=4)	2	5(see descr. notes)	Carpo-metacarpal		" " "
2		2	5	Metacarpo-phalangeal		" " "
3		2	3	Interphalangeal		" " "
4		4	5	Proximal		
5	5(upper & lower)	2	4	Distal		
6	5(upper & lower)	2		Sacro-iliac		4
7	5(sup. & inf. art. facets)	5(see descr. notes)	5	Symphysis pubis		4(pitting and flattening)
8		4		Hip		
9		4		Acetabulum		3
10	* art. facets	5		Head of femur		2(inf. surface)
11		5		Knee		
12		5		Femur		2
Sacral see descriptive notes				Tibia		1
Coccygeal -				Patella		2
Claviculo-manubrial		5	4	Tibio-fibular		
Manubrio-corporal		fused(A)		Proximal		0
Xiphoid		3		Distal		-
Costal				Ankle joints		
Head		5(see descr. notes)	5	Tibio-talar		4(fibula:5)
Costal-chondral		5	5	Intertarsal		(see descr. notes)
Shoulder				Tarso-metatarsal		" " "
Acromio-clavicular		5	-	Metatarsal-phalangeal		" " "
Glenoid fossa		3	3	Interphalangeal		" " "
Head of humerus		1	0	Proximal		3
Elbow				Distal		1
Humerus		5	1			
Radius		4	1			
Ulna		5	3			
Radio-ulnar (Proximal)		5(radius & ulna)	2(ulna)			
(Distal)		2	2(radius) 5(ulna)(eburnization and lipping)			

## DESCRIPTIVE NOTES:

Left foot: talus 5 (on post. ant. surf. with calcaneous)  
 calcaneous 3 (at art. above) (ant. joint = 2) stage 4 spur on superior surf. of articulation with cuboid  
 cuboid 3 (ant. surf. of cuboid at art. with metatarsal no. 5)  
 navicular 3 (at art. with talus)  
 other intercarpals = 2  
 sesamoid bones 4

Right foot: calcaneous talus -  
 talus 5 (sup. & lat. surfaces) post. -inf. art. surf. = 4  
 navicular -  
 cuboid 2 (post. art. surf.) (lat. & ant. art. surf. = 1)  
 1st cuneiform 2 (anterior & posterior)  
 2nd cuneiform 2  
 1st metatarsal 2 (prox. end)  
 2nd metatarsal 5 (distal end) (lipping, pitting, eburnization)  
 3rd metatarsal 2 (proximal)  
 4th metatarsal 3 (distal) (spur post. to art. facet)  
 5th metatarsal 1 (prox.)  
 2 (ant.) (or distal)  
 1 (prox.)  
 - (distal)  
 2 (prox.)  
 1 (distal)

1st phalanx of great toe = 3 on proximal and 5 on distal end. Very pronounced lipping, pitting, and eburnization.

Distal phalanx of great toe = 5

1st phalanx of 2nd toe = 2 proximally and 5 distally. Distal end shows pronounced erosion on medial aspect.

2nd phalanx of 2nd toe = 3 proximally and 5 distally. (lipping esp. pron. on lateral side of inferior surface)

1st phalanx of 3rd toe = 4 proximally and 3 distally. (proximal end is quite flattened and bevelled on its superior surface, pitting is present on the superior surface and lateral side)

1st (proximal) phalanx of 4th toe (as in 3rd toe except distal = 2.)

Middle and distal phalanges of 3rd and 4th toes missing.

Two sesamoid bones exhibit very pronounced (stage 5) lipping, pitting, and eburnization.

Left Hand			Right Hand		
Carpals:			Carpals:		
navicular	1		navicular	1	
lunate	0		lunate	0	
triquetrum	1 (2 at art. with pisiform)		triquetrum	1 (3 at art. with pisiform)	
pisiform	5		pisiform	5	
Gr. multangular	1 (4 at art. with 1st metacarpal)		Gr. multangular	1 (2 at art. with 1st metacarpal)	
Lesser "	1		Lesser "	2	
capitate	1		capitate	1	
hamate	1		hamate	1	
Metacarpals:			Metacarpals:		
	proximal	distal		proximal	distal
1.	2	4 (spur on inf. surf.)	1.	1	4 (inf. surf. of joint)
2.	0	0	2.	1	1
3.	0	1	3.	1	1
4.	1	0	4.	1	1
5.	1	1	5.	-	3 (sup. & lat. surf., inf. surf. =4)
5th metacarpal shows evidence of healed fracture at proximal 1/2 of shaft. Bony spur on medial side in this area.					
Proximal phalanges:			Proximal phalanges:		
	proximal	distal		proximal	distal
1.	3	1	1.	2	2
2.	2	1	2.	0	0
3.	2	1	3.	0	4
4.	2	1	4.	1	3
5.	2	1	5.	3*	0
Middle phalanges:			*spur on medial surface		
	proximal	distal	Middle phalanges:		
1.	-	-		proximal	distal
2.	2	1	1.	-	-
3.	2	2	2.	0	0
4.	-	-	3.	4	0
5.	-	-	4.	3	0
Distal phalanges			5.	0	0
1.	-	-	Distal phalanges:		
2.	-	-	1.	-	-
3.	-	-	2.	2	2
4.	-	-	3.	2	2
5.	-	-	4.	2	2
			5.	-	-

Both lower permanent 3rd molars lost pre-mortem. Upper permanent premolar 2 and all molars lost on both sides pre-mortem. Left upper central permanent incisors lost pre-mortem. Upper alveolar margins show considerable resorption. Odontoid fossa and process exhibit stage 4 osteoarthritic change. All intervertebral joints show osteoarthritic change ranging from stage 2 to stage 5. Thoracic vertebra no. 8 shows collapse and osteophytosis. Articular processes on this vertebra also exhibit stage 5 osteoarthritic involvement. Thoracic vertebra no. 10 exhibits 1.5 x 1.5 cm. osteophyte on upper surface of body on right side. Superior and inferior articular processes of thoracic vertebra no. 10 show stage 5 osteoarthritic change and vertebral body of thoracic vertebra no. 11 is collapsed on the right side. The thoracic intervertebral joint no. 11 presents osteophytosis on the right side involving both vertebrae no. 11 and 12. The superior and inferior articular processes of these vertebrae are also involved (more pronounced lipping and pitting on the right ones). The associated rib demi-facets are also severely affected and show pronounced lipping and pitting. The twelfth thoracic intervertebral joint shows stage 5 osteoarthritic change bilaterally at the inferior articular processes of T12 and superior articular processes of L1. Stage 5 lipping is present on the bodies of these two vertebrae also.

Due to the very severe osteoarthritic involvement of the lumbar and sacral regions, the vertebrae will be described individually rather than the intervertebral joints in general.

Lumbar vertebra no. 1: Very pronounced osteophytosis, especially on left inferior anterior surface of body. Body of vertebra shows collapse anteriorly. Inferior articular processes also show pronounced involvement.

Lumbar vertebra no. 2: The left side of the body of this vertebra shows a very large cavity occupying 75-80% of its total volume. No evidence of necrosis or new bone growth is present. Pronounced osteophytosis is present on the left side of the body of this vertebra on both its superior and inferior aspects. These exostoses give complete support to the vertebral column on this side. The superior and inferior articular processes of this vertebra are also severely involved with osteoarthritic change.

Lumbar vertebra no. 3: A very large osteophyte on the upper left anterior margin of the body of the vertebra gives support to osteophyte from lumbar vertebra no. 2. Here again the superior and inferior articular processes also show osteoarthritic involvement. The inferior surface of the body of the vertebra exhibits stage 3 lipping.

Lumbar vertebra no. 4: The superior surface of the body of this vertebra exhibits stage 3 lipping on its anterior aspect. A stage 3 osteoarthritic involvement is also present on the superior articular processes. The inferior articular processes exhibit a stage 5 involvement. On the inferior surface of the body of this vertebra a stage 4 osteophytosis is to be found on the right and left posterior aspects.

Lumbar vertebra no. 5: The superior and inferior surfaces of the vertebral body show stage 4 osteoarthritic change (on both right and left on the superior surface). A stage 5 osteophytosis and flattening are present on the superior articular processes while the inferior articular processes exhibit stage 4 osteoarthritic change.

Sacral vertebra no. 1: S1 is not fused with the remainder of the sacrum. The superior articular processes show stage 5 lipping and flattening. A slight flattening to the left and posterior is present on the superior surface of the body of the vertebra. The inferior articular processes exhibit a stage 5 osteoarthritic involvement on the right and a stage 3 involvement on the left side. The transverse process on the right side articulates with S2. At this articulation a stage 5 osteophytosis and erosion are present.

Sacral vertebrae no. 2 to no. 5: The superior surface of S2 presents stage 4 osteophytosis on left posterior and right anterior corners. The superior articular processes of S2 show stage 5 osteophytosis and flattening. Stage 5 osteophytosis and flattening are also present in the left sacroiliac joint while the right one exhibits a stage 4 involvement.

The claviculo-mambril joints show pronounced osteoarthritic change. Fusion of the manubrium with the body of the sternum is present. The body of the sternum exhibits extensive osteoarthritic change at the rib attachments. A stage 5 osteophytosis is present at both the head and costo-chondral ends of the ribs. The right acromio-clavicular joint presents a stage 5 osteoarthritic involvement. Both scapulae show a moderate amount of osteoarthritic change in the glenoid fossa of the shoulder joint.

A rather pronounced osteoarthritic involvement of the right elbow joint is present with the humerus and ulna exhibiting the most severe changes. At the junction of its middle and distal one third, the right radius shows a complete traumatic fracture which is not united. Extensive osteophytosis, pitting, and erosion are present around the break (at the point of breakage).

The symphysis pubis shows a stage 4 pitting and flattening. At the hip joint, the right and left acetabulae exhibit moderate osteoarthritic change. The right patella shows a stage 3 osteophytosis.

At the ankle, both tibio-talar joints present a stage 4 osteoarthritic involvement (the right distal fibula = stage 5). The left talus, calcaneus, cuboid, navicular, and sesamoid bones show stage 3 to stage 5 osteoarthritic change. A stage 5 osteoarthritis is present in the right talus, 1st right metatarsal, and proximal and distal phalanges. The 1st and 2nd phalanges of the right second toe also show pronounced osteoarthritic change, especially at their distal ends. A stage 4 osteoarthritis is exhibited in the proximal phalanges of the right third and fourth toes. The sesamoid bones of the right foot show very pronounced (stage 5) eburnization, lipping, and pitting.

The left and right hands also show osteoarthritic change. The most pronounced involvement in the hands is to be found in the pisiforms, distal ends of some metacarpals, and proximal ends of middle phalanges. The left fifth metacarpal presents evidence of a healed traumatic fracture in the proximal end (1/2) of its shaft. A bony spur is also present on the medial side of the shaft of this metatarsal in the area of the fracture.

The costal cartilages of this case show ossification.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IswantidSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 6219 B.C. ± 488No. Ra501-20  
Physiological Age 35Age: Suture -  
Dental 35Epiphyseal -  
Symphysial (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		-	-	Wrist		
Occipito-cervical		-	-	Radius		1
Intervertebral:				Ulna		1
	Cervical	Thoracic	Lumbar	Carpals		1-2
1	-	2	1	Carpo-metacarpal		1
2	2	1	3 (sup. surf. L3)	Metacarpo-phalangeal		1
3	2	1	4 (sup. surf. L4) *	Interphalangeal		
4	2	0	-	Proximal		1
5	2	0	4	Distal		2
6	2	1		Sacro-iliac		1
7	2	0	*inf. sur. L3 = 3	Symphysis pubis		-
8	2	0		Hip		
9		0		Acetabulum		2
10		0		Head of femur		1
11		0		Knee		
12		1		Femur		1
Sacral 2		RIGHT		Tibia		-
Coccygeal 2		(S1 not fused with rest of sacrum)		Patella		1 (sup. surf., inf. missing)
Claviculo-manubrial		0	1	Tibio-fibular		
Manubrio-corporal		2		Proximal		-
Xiphoid		2		Distal		-
Costal				Ankle joints		
Head		1	1	Tibio-talar		-
Costal-chondral		3	3	Intertarsal		-
Shoulder				Tarso-metatarsal		-
Acromio-clavicular		-	2 (clavicle, acromion 1 = 0)	Metatarsal-phalangeal		-
Glenoid fossa		-	1	Interphalangeal		
Head of humerus		-	1	Proximal		-
Elbow				Distal		-
Humerus		-	1			
Radius		-	0			
Ulna		-	2			
Radio-ulnar (Proximal)		-	2			
(Distal)		-	1			

## DESCRIPTIVE NOTES:

Lumbar intervertebral joints 2, 3 and 5 exhibit stage 3 and 4 osteoarthritic change. Fragments of L4 indicate osteoarthritic involvement also. The inferior surface of the fifth lumbar vertebral body is depressed and concave in its center. Stage 3 lipping is present on the anterior edge of the upper surface of the first sacral vertebra. The first sacral vertebra is not fused with the remainder of the sacrum.

The ribs of this individual indicate a medium amount of osteophytosis at their articulations with the transverse processes of the thoracic vertebrae and at their costochondral junctions. A stage 3 erosion and osteophytosis are present along the anterior edge of the symphysis pubis.

A healed and united traumatic fracture is evident in the middle of the shaft of the left humerus. An extensive osteolytic lesion is present in the left acetabulum. The absence of necrotic changes and new bone formation are to be noted. This lesion extends through the floor of the fossa and articular surface of the acetabulum. Pronounced osteophytosis and pitting are present about the lesion. The head of the femur, however, was not affected.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety IllinidSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 3657 B.C. ± 164  
to 5044 B.C. ± 150No. Ra501-21  
Physiological Age 73Age: Suture 65-81  
Dental 70Epiphyseal -  
Symphysial (pubic) -

JOINT	RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular	0	0	Wrist		
Occipito-cervical	-	-	Radius		
Intervertebral:	Cervical	Thoracic	Ulna		
1			Carpals		
2	<u>SKULL ONLY</u>		Carpometacarpal		
3			Metacarpophalangeal		
4			Interphalangeal		
5			Proximal		
6			Distal		
7			Sacro-iliac		
8			Symphysis pubis		
9			Hip		
10			Acetabulum		
11			Head of femur		
12			Knee		
Sacral			Femur		
Coccygeal			Tibia		
Claviculo-manubrial	<u>SKULL ONLY</u>		Patella		
Manubrio-corporal			Tibio-fibular		
Xiphoid			Proximal		
Costal			Distal		
Head			Ankle joints		
Costal-chondral			Tibio-talar		
Shoulder			Intertarsal		
Acromio-clavicular			Tarso-metatarsal		
Glenoid fossa			Metatarsal-phalangeal		
Head of humerus			Interphalangeal		
Elbow			Proximal		
Humerus			Distal		
Radius					
Ulna					
Radio-ulnar					
(Proximal)					
(Distal)					

## DESCRIPTIVE NOTES:

Only skull bones present. No pathology in skull indicated.



## OBSERVATION BLANK FOR OSTEOPATHOLOGY

 Sex Female  
 Variety Lenid

 Site Modoc Rock Shelter  
 Culture Medial Archaic  
 Antiquity 6219 B.C. ± 488

 No. Ra501-22  
 Physiological Age 13

 Age: Suture -  
 Dental -

 Epiphyseal -  
 Symphysial (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		1	1	Radius		-
Intervertebral:				Ulna		0
1		Cervical 1	Thoracic -	Carpals		0
2		0	-	Carpo-metacarpal		0
3		0	-	Metacarpo-phalangeal		0
4		0	-	Interphalangeal		
5		0	-	Proximal		0
6		0	-	Distal		0
7		0	-	Sacro-iliac		1
8		-	-	Symphysis pubis		-
9		-	-	Hip		
10		-	-	Acetabulum		-
11		-	-	Head of femur		-
12		-	-	Knee		
Sacral -				Femur		0
Coccygeal -				Tibia		0
Claviculo-manubrial		-	-	Patella		0
Manubrio-corporal -				Tibio-fibular		
Xiphoid -				Proximal		-
Costal				Distal		-
Head		-	-	Ankle joints		
Costal-chondral		0	0	Tibio-talar		0
Shoulder				Intertarsal		0
Acromio-clavicular		-	0	Tarso-metatarsal		0
Glenoid fossa		-	-	Metatarsal-phalangeal		-
Head of humerus		-	-	Interphalangeal		
Elbow				Proximal		-
Humerus		-	-	Distal		-
Radius		0	-			
Ulna		-	-			
Radio-ulnar						
(Proximal)		-	-			
(Distal)		-	-			

## DESCRIPTIVE NOTES:

No pathology indicated in skeletal remains.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

 Sex Female  
 Variety Illinid

 Site Modoc Rock Shelter  
 Culture Medial Archaic  
 Antiquity 3657 B.C.  $\pm$  164  
 to 5044 B.C.  $\pm$  150

 No. Ra501-23  
 Physiological Age 70

 Age: Suture - Epiphyseal -  
 Dental 70 to 5044 B.C.  $\pm$  150 Symphysial (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		<u>MANDIBLE ONLY</u>		Wrist		
Occipito-cervical				Radius		
Intervertebral:	Cervical	Thoracic	Lumbar	Ulna	<u>MANDIBLE ONLY</u>	
1				Carpals		
2				Carpo-metacarpal		
3				Metacarpo-phalangeal		
4	<u>MANDIBLE ONLY</u>			Interphalangeal		
5				Proximal		
6				Distal		
7				Sacro-iliac		
8				Symphysis pubis		
9						
10						
11						
12						
		RIGHT	LEFT			
Sacral				Hip		
Coccygeal				Acetabulum		
Claviculo-manubrial		<u>MANDIBLE ONLY</u>		Head of femur		
Manubrio-corporal				Knee		
Xiphoid				Femur		
Costal				Tibia		
Head				Patella		
Costal-chondral				Tibio-fibular		
				Proximal		
Shoulder				Distal		
Acromio-clavicular				Ankle joints		
Glenoid fossa				Tibio-talar		
Head of humerus				Invertarsal		
				Tarso-metatarsal		
Elbow				Metatarsal-phalangeal		
Humerus				Interphalangeal		
Radius				Proximal		
Ulna				Distal		
Radio-ulnar						
(Proximal)						
(Distal)						

DESCRIPTIVE NOTES:

Skeletal remains consist of mandible only. Right and left permanent premolars and molars 1, 2, & 3 lost pre-mortem. Alveolar bone considerably resorbed along margins.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IlliniidSite Modoc Rock Shelter  
Culture Medieval Archaic  
Antiquity 3657 B.C. ± 164  
to 5044 B.C. ± 150No. Ra501-24  
Physiological Age 28Age: Suture 29-35  
Dental 28Epiphyseal 27-28  
Symphyseal (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		2	2	Radius		1
Intervertebral:	Cervical			Ulna		0
	1	1	3	Carpals		1
	2	1	3	Carpo-metacarpal		1
	3	1	3	Metacarpo-phalangeal		1
	4	1	2	Interphalangeal		
	5	3	2	Proximal		1
	6	2	-	Distal		1
	7	1	-	Sacro-iliac		1
	8	-	-	Symphysis pubis		-
	9	-	-	Hip		
	10	1	-	Acetabulum		-
	11	1	-	Head of femur		0
	12	1	-	Knee		
Sacral	2			Femur		1
Coccygeal	-			Tibia		0
Claviculo-manubrial		0	0	Patella		2
Manubrio-corporal	0			Tibio-fibular		
Xiphoid	1			Proximal		1
Costal				Distal		-
Head		0	0	Ankle joints		
Costal-chondral		0	0	Tibio-talar		1
Shoulder				Intertarsal		1 (navicular = 2 proximally)
Acromio-clavicular		0	-	Tarso-metatarsal		-
Glenoid fossa		0	-	Metatarsal-phalangeal		1
Head of humerus		0	0	Interphalangeal		
Elbow				Proximal		-
Humerus		-	0	Distal		-
Radius		1	0			
Ulna		1	1			
Radio-ulnar						
(Proximal)		1	1			
(Distal)		1	0			

## DESCRIPTIVE NOTES:

The middle cervical and upper three lumbar intervertebral joints show a medium amount of osteoarthritic involvement. A healed depressed fracture of the outer table of the left parietal and frontal bones is present. The lesion measures approximately 1 x 2.5 cm. and crosses the coronal suture at its midpoint (midpoint of lesion).

No. Ra501-25  
Physiological Age 47

Age: \_\_\_\_\_ Suture \_\_\_\_\_  
Dental \_\_\_\_\_

Epiphyseal \_\_\_\_\_ -  
Symphysial (pubic) \_\_\_\_\_ - lipping

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		-	-	Wrist		
Occipito-cervical		-	-	Radius	3(see descr.	-
				Ulna	- notes)	-
Intervertebral:	Cervical	Thoracic	Lumbar	Carpals	2	-
1	-	-	2			
2			4	Carpo-metacarpal	1	-
3	See descriptive notes		4	Metacarpo-phalangeal	2	-
4			5			
5			2	Interphalangeal		
6				Proximal	-	-
7				Distal	-	-
8						
9				Sacro-iliac	1	1
10						
11				Symphysis pubis	-	-
12						
		RIGHT	LEFT			
Sacral 1				Hip		
Coccygeal -				Acetabulum	0	-
				Head of femur	-	-
Claviculo-manubrial	2	-	Knee			
		-	Femur	-	-	
Manubrio-corporal	-	-	Tibia	-	1	
Xiphoid	-	-		Patella	-	1
Costal				Tibio-fibular		
Head	-	3	Proximal	-	-	
Costal-chondral	-	-	Distal	-	-	
Shoulder				Ankle joints		
Acromio-clavicular	2	-	Tibio-talar	-	-	
Glenoid fossa	-	-	Intertarsal	-	-	
Head of humerus	-	-				
				Tarso-metatarsal	-	-
Elbow						
Humerus	-	-	Metatarsal-phalangeal	-	-	
Radius	1	-				
Ulna	2	-	Interphalangeal			
Radio-ulnar			Proximal	-	-	
(Proximal)	3(ulna, radius;2)	-	Distal	-	-	
(Distal)	2(radius)	-				

DESCRIPTIVE NOTES:

One upper cervical vertebra shows an incomplete development of the neural arch. The superior articular process of this vertebra shows stage 4 osteophytosis and flattening. Stage 3 osteoarthritic involvement is present on the right anterior inferior surface of the body of this vertebra. A lower cervical vertebra shows stage 4 lippling on its superior and stage 3 lippling on its inferior surface. The superior and inferior articular processes of this vertebra are uninvolved.

One fragment of a thoracic vertebra exhibits a stage 3 osteophytosis and pitting. Four other thoracic vertebrae are represented by fragments indicating stage 1 and 2 osteoarthritic involvement.

The middle three lumbar intervertebral joints show a pronounced involvement with osteoarthritic change. The upper surface of the body of L5 has a large osteophyte on its anterior aspect. Pronounced pitting and erosion are present posterior to the osteophyte. Lumbar vertebra number four exhibits a medium amount of osteoarthritic change on its inferior anterior edge. At the second lumbar intervertebral joint, the osteoarthritic lipping is more pronounced on the upper surface of the body of L3 than on the lower surface of L2. The superior and inferior articular processes at this joint exhibit relatively little involvement. Sacral vertebra number one is not fused with the remainder of the sacrum.

Fragments of several left ribs exhibit a stage 3 osteophytosis. The right proximal radio-ulnar joint exhibits a medium amount of osteoarthritic change. At the right wrist the radius presents stage 3 erosion and pitting at its articulation with the lunate.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety -Sire Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 3657 B.C.  $\pm$  164No. Ra501-26  
Physiological Age 45Age: Suture -  
Dental -to 5044 B.C.  $\pm$  150Epiphyseal -  
Symphyseal (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		-	-	Wrist		
Occipito-cervical		-	-	Radius		2
Intervertebral:				Ulna		0
	Cervical			Carpals		-
1	2	--	--	Carpo-metacarpal		-
2	2			Metacarpophalangeal		-
3	-			Interphalangeal		
4	-			Proximal		-
5	-			Distal		-
6	-			Sacro-iliac		-
7	-			Symphysis pubis		-
8				Hip		
9				Acetabulum		2
10				Head of femur		0
11				Knee		
12				Femur		-
Sacral -				Tibia		-
Coccygeal -				Patella		-
Claviculo-manubrial		-	-	Tibio-fibular		
Manubrio-corporal		-	-	Proximal		-
Xiphoid		-	-	Distal		-
Costal				Ankle joints		
Head		-	-	Tibio-talar		-
Costal-chondral		-	-	Intertarsal		-
Shoulder				Tarsometatarsal		-
Acromio-clavicular		-	-	Metatarsal-phalangeal		-
Glenoid fossa		-	-	Interphalangeal		
Head of humerus		-	-	Proximal		-
Elbow				Distal		-
Humerus		2	-			
Radius		-	0			
Ulna		3	4			
Radio-ulnar						
(Proximal)		3(ulna)	3(see descr.			
(Distal)		-	- notes)			

## DESCRIPTIVE NOTES:

The proximal posterior surfaces of both ulnae show extensive evidence of an osteolytic lesion, erosion, pitting, and osteophytosis (osteitis). At the lateral surface of the greater trochanter, the left femur also exhibits an area of osteoporosis and erosion (also osteitis).

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety IswandSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 6219 B.C. ± 488No. Ra501-27  
Physiological Age 45Age: Suture 42-47  
Dental 55+Epiphyseal -  
Symphysial (pubic) -

JOINT	RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular	1	1	Wrist		
Occipito-cervical	1	1	Radius	4	3
Intervertebral:	Cervical	Thoracic	Ulna	-	-
1	--	--	Carpals	-	2
2			Carpometacarpal	2	1
3			Metacarpophalangeal	1	1
4		4	Interphalangeal		
5		4	Proximal	2	2
6			Distal	2	2
7			Sacro-iliac	2	-
8			Symphysis pubis	-	-
9					
10			Hip		
11			Acetabulum	2	-
12			Head of femur	-	-
Sacral -	RIGHT	LEFT	Knee		
Coccygeal -			Femur	2	1
Claviculo-manubrial -	-	-	Tibia	2	1
Manubrio-corporal -			Patella	1	1
Xiphoid -			Tibio-fibular		
Costal			Proximal	1	-
Head	3	3	Distal	-	0
Costal-chondral	2	2	Ankle joints		
Shoulder			Tibio-talar	1	1
Acromio-clavicular	3	-	Intertarsal	2	1
Glenoid fossa	2	2	Tarso-metatarsal	2	2
Head of humerus	-	-	Metatarsal-phalangeal	3*	2
Elbow			Interphalangeal		
Humerus	2	-	Proximal	5(3rd prox.	2
Radius	0	3	Distal	- phalanx)	2
Ulna	3	1	*third toe. Rt. 4th metatarsal:4		
Radio-ulnar					
(Proximal)	1(radius)	1(ulna)			
(Distal)	0	-			

## DESCRIPTIVE NOTES:

Fragments of two lumbar vertebrae show pronounced osteoarthritic change. One of the vertebral bodies exhibits compression and collapse of its anterior portion. The inferior and superior surfaces of the vertebral body are both somewhat concave.

A medium amount of osteoarthritic change is present on the acromial process of the right acromio-clavicular joint. At the elbow joints, the left radius and right ulna also exhibit a medium degree of osteoarthritic lipping.

The right wrist joint shows a stage 4 osteoarthritis of the radius, while a stage 3 involvement is present at the left wrist. The right metatarso-phalangeal joints of three toes present medium to pronounced osteoarthritic changes. A stage 5 osteoarthritis is present involving the proximal phalanx of the third toe.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety IswanidSite Modoc Rock Shelter  
Culture Medial Archaic  
Antiquity 6219 B.C. ± 488No. Ra501-28  
Physiological Age 45-50

Age:

Suture -  
Dental -Epiphyseal -  
Symphyseal (pubic) 45

JOINT		RIGHT	LEFT	JOINT		RIGHT	LEFT
Temporo-mandibular		-	-	Wrist			
Occipito-cervical		-	-	Radius		-	-
Intervertebral:				Ulna		0	-
	Cervical			Carpals		1	1
	Thoracic			Carpo-metacarpal		1	-
1	--	--	--	Metacarpo-phalangeal		1	1
2				Interphalangeal			
3				Proximal		-	0(1 joint)
4				Distal		2	2
5				Sacro-iliac		-	-
6				Symphysis pubis		3	-
7				Hip			
8				Acetabulum		-	1
9				Head of femur		-	0
10				Knee			
11				Femur		-	-
12				Tibia		-	0
Sacral -				Patella		-	-
Coccygeal -				Tibio-fibular			
Claviculo-manubrial		1	-	Proximal		1	-
Manubrio-corporal		-	-	Distal		0	-
Xiphoid -				Ankle joints			
Costal				Tibio-talar		1	1
Head		1 & 2	1 & 2	Intertarsal		1	1*
Costal-chondral		-	2	Tarso-metatarsal		0(Gr. & little toes:1)	1(Gr. toe:2)
Shoulder				Metatarsal-phalangeal		0(Gr. toe:1)	1(phalanx)
Acromio-clavicular		1	-	Interphalangeal			
Glenoid fossa		1	-	Proximal		0	0
Head of humerus		1	1	Distal		-(Gr. toe:0)	-
Elbow				*1st cuneiform eburnized on proximal articulating facet:		2	
Humerus		1	0				
Radius		-	1				
Ulna		1	-				
Radio-ulnar							
(Proximal)		2	0				
(Distal)		-	-				

## DESCRIPTIVE NOTES:

A small fragment of the body of one lumbar vertebra indicates a medium amount of lipping and pitting along its anterior edge. The symphysis pubis shows a stage 3 erosion and pitting along its posterior edge.



## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety IswanidSite Modoc Rock Shelter  
Culture Medial Archaic I  
Antiquity 6219 B.C. ± 488No. Ra501-29  
Physiological Age 47Age: 42-47  
Suture 60  
Dental 60Epiphyseal -  
Symphyseal (pubic) 47

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0		Wrist		
Occipito-cervical		2		Radius		5
				Ulna		-
				Carpals		(see descr. notes)
Intervertebral	Cervical	Thoracic	Lumbar	Carpo-metacarpal		1*
1	3	4(art. processes)	2	Metacarpo-phalangeal		1**
2	4	3	4	Interphalangeal		
3	4	3	5	Proximal		1
4	5	3	4	Distal		3
5	5	2	2	Sacro-iliac		3
6	5	2		Symphysis pubis		-
7	4	2		Hip		
8		2		Acetabulum		2
9		1		Head of femur		0
10		1		Knee		
11		1		Femur		2
12		1		Tibia		2
				Patella		1
Sacral	0			Tibio-fibular		
Coccygeal	1			Proximal		-
				Distal		1
Claviculo-manubrial	3		3	Ankle joints		
Manubrio-corporal	4		-	Tibio-talar		2
Xiphoid	4		-	Intertarsal		2(3rd cuneiform:3.spur)
Costal				Tarso-metatarsal		2
Head	5		5	Metatarsal-phalangeal		2(Gr. toe:5)
Costal-chondral	5		5	Interphalangeal		
Shoulder				Proximal		0
Acromio-clavicular	-		4(clavicle)	Distal		-
Glenoid fossa	4		3			
Head of humerus	1		1			
Elbow						
Humerus	5		5			
Radius	5		4			
Ulna	5		4			
Radio-ulnar						
(Proximal)	5		4			
(Distal)	5		4			

## DESCRIPTIVE NOTES:

\* 2nd and 3rd: 2

\*\* 2nd: 2 and thumb: 3 on metacarpals

Dental pathology is present. An alveolar abscess can be seen in the area of the left upper permanent canine, 1st permanent premolar, 2nd permanent premolar and all three permanent molars. The 2nd upper premolar and all three permanent molars are missing (pre-mortem loss) and the alveolar margins show extensive resorption. In the mandible, the region of the three permanent molars on the right side shows pronounced alveolar resorption and the 3rd permanent molar was lost pre-mortem. The alveolar margins exhibit much resorption on the left side of the mandible, especially in the area extending from the 2nd permanent premolar through the 3rd permanent molar. The teeth all show extreme dental attrition.

A pronounced degree of osteoarthritic change is present in the cervical intervertebral joints. The odontoid fossa exhibits a stage 5 involvement with osteoarthritis. The upper four intervertebral joints show a medium degree of osteoarthritic change, while in the lumbar region the second, third and fourth intervertebral joints exhibit a pronounced degree of involvement. Stage 5 osteoarthritic change is found at the transverse processes and inferior demifacets of the ninth thoracic vertebra.

The claviculo-manubrial joints show a medium degree of involvement with osteoarthritis. The manubrio-corporal, rib, acromio-clavicular, and right glenoid fossa exhibit a pronounced amount of osteoarthritic change. A stage 3 or medium involvement is present in the left glenoid fossa at the shoulder joint. The humeral heads show relatively little involvement.

At the elbow, radio-ulnar, and wrist joints, a pronounced degree of osteoarthritis is also to be seen. Both the right and left hands show osteoarthritic change. The distal interphalangeal joints exhibit a medium degree of involvement with osteoarthritis.

The great toes both have a pronounced osteoarthritic involvement at the metatarso-phalangeal joints and the fourth proximal interphalangeal joint shows a stage 5 osteoarthritic change at the proximal phalanx.

## Left Hand:

pisiform 4  
triquetrum 5  
others 3

## Right Hand:

navicular 5  
capitate 3  
hamate 3  
trapezium 4  
trapezoid 3  
lunate 5 (eburnization and osteophytosis at articulation with radius)

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Male  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra502-1  
Physiological Age 70Age: Suture 65-81  
Dental 70Epiphyseal -  
Symphyseal (pubic) -

JOINT		RIGHT		LEFT		JOINT		RIGHT		LEFT	
Temporo-mandibular		1		1		Wrist					
Occipito-cervical		2		2		Radius		2		1	
Intervertebral:		Cervical		Thoracic		Ulna		1		0	
						Carpals		1		2	
1		2		3		Carpo-metacarpal		-		1	
2		2		3		Metacarpo-phalangeal		0		0	
3		2		2		Interphalangeal					
4		-		A		Proximal		3		2	
5		-		A		Distal		-		3	
6		-		A		Sacro-iliac		-		-	
7		2		A		Symphysis pubis		3		3	
8				A		Hip					
9				A		Acetabulum		-		3(most pron.	
10				A		Head of femur		-		1 post.)	
11				A		Knee					
12				A		Femur		3		-	
Sacral -		RIGHT		LEFT		Tibia		3		3	
Coccygeal -						Patella		-		-	
Claviculo-manubrial		-		3		Tibio-fibular					
Manubrio-corporal A (sternabra no. 4 perforate)						Proximal		1		3	
Xiphoid 2						Distal		1		1	
Costal						Ankle joints					
Head		3		3		Tubio-talar		1		2	
Costal-chondral		3		3		Intertarsal		1		2	
Shoulder						Tarso-metatarsal		1		1	
Acromio-clavicular		1		1		Metatarsal-phalangeal		3(rt. prox.phal :1)		3(l. prox.phal :1)	
Glenoid fossa		3*		-		Interphalangeal					
Head of humerus		2*		-		Proximal		1		-	
Elbow						Distal		-		-	
Humerus		2		-							
Radius		1		1							
Ulna		3		2							
Radio-ulnar											
(Proximal)		1		0							
(Distal)		1		1							

DESCRIPTIVE NOTES: \* most pronounced anteriorly A = ankylosed

A slight amount of osteoarthritic involvement is present in the cervical intervertebral joints. The upper three thoracic intervertebral joints exhibit a medium degree of osteoarthrititis. The remaining nine thoracic and all five lumbar intervertebral joints are ankylosed (Marie-Strümpke disease or rheumatoid spondylitis). Fusion of the manubrio-corporal joint is seen. Sternabra number four is perforated (failure of fusion of the bilateral centers of ossification). The ribs of this specimen exhibit a medium degree of osteoarthritic change.

A medium amount of osteoarthritic change is also shown in the right glenoid fossa (scapula) (most pronounced anteriorly), the right ulna at the elbow joint, the right proximal interphalangeal joints, the left distal interphalangeal joints, the left acetabulum (most pronounced anteriorly), the right femur at the knee joint, both tibiae at the knee joints, the left proximal tibio-fibular joint and the right and left metatarso-phalangeal joints.

An acute osteomyelitis of a rather severe nature is evident in both femora. The distal 60% of the right femur and approximately the distal 70% of the left femur are affected.

All the bones of the skeleton are extremely light in weight, the dense bone cortex is very thinned (in some areas less than 1 mm. in thickness), and the trabeculae of the cancellous bone are fine and lacy in appearance. This generalized osteoporosis in conjunction with the other pronounced pathology in this case is quite suggestive of a severe osteoporosis of disuse.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra502-2a  
Physiological Age 28Age: Suture 26-29  
Dental 28Epiphyseal 28 +  
Symphyseal (pubic) -

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	0	Wrist		
Occipito-cervical		1	1	Radius		1
Intervertebral		Cervical	Thoracic	Ulna		0
1		--	4 thoracic vertebrae indicate stage 1 or less osteoarthritic change.	Carpals		0
2			1 lower thoracic vertebra shows stage 3 involvement on its inferior surface. Lipping and pitting are present on its posterior edge.	Carpo-metacarpal		0
3				Metacarpophalangeal		0(5th:3)
4				Interphalangeal		
5			1 lumbar vertebra shows stage 3 lipping on the superior surface of its body. (inferior surface:2).	Proximal		-
6				Distal		-
7				Sacro-iliac		2
8				Symphysis pubis		-
9				Hip		
10				Acetabulum		1
11				Head of femur		1
12				Knee		
Sacral -		RIGHT	LEFT	Femur		0
Coccygeal 2				Tibia		0
Claviculo-manubrial		0	-	Patella		1
Manubrio-corporal		2		Tibio-fibular		
Xiphoid		-		Proximal		1
Costal				Distal		1
Head		2	2	Ankle joints		
Costal-chondral		-	-	Tibio-talar		0
Shoulder				Intertarsal		1
Acromio-clavicular		0	-	Tarsometatarsal		1
Glenoid fossa		-	1	Metatarsal-phalangeal		-
Head of humerus		1	-	Interphalangeal		
Elbow				Proximal		-
Humerus		1	1	Distal		-
Radius		0	-			
Ulna		1	1			
Radio-ulnar (Proximal)		1	0			
(Distal)		1	-			

## DESCRIPTIVE NOTES:

The left frontal bone exhibits an osteoma approximately 3.5 x 3.5 cm. in size in the area of the left temporal line above the zygofrontal articulation. A stage 3 osteophytosis and erosion are present at the tarso-metatarsal junction on the 3rd left metatarsal. A "pit" 5 x 5 mm. x 3 mm. deep is present in this area. The 3rd cuneiform also shows a "pit" of approximately this size and stage 3 osteoarthritic change.

## OBSERVATION BLANK FOR OSTEOPATHOLOGY

Sex Female  
Variety -Site Modoc Rock Shelter  
Culture Archaic  
Antiquity -No. Ra502-2b  
Physiological Age 53Age: -  
Suture -  
Dental -Epiphyseal -  
Symphysial (pubic) 50+

JOINT		RIGHT	LEFT	JOINT	RIGHT	LEFT
Temporo-mandibular		0	-	Wrist		
Occipito-cervical		-	0	Radius	-	0
Intervertebral:	Cervical	Thoracic	Lumbar	Ulna	-	-
				Carpals	0(tunate only)	-
				Carpometacarpal	2(no.3 only)	-
				Metacarpophalangeal	-	-
				Interphalangeal		
				Proximal	-	-
				Distal	-	-
				Sacro-iliac	2	2
				Symphysis pubis	5(ant. edge)	-
				Hip		
				Acetabulum	-	2(post. sup. edge)
				Head of femur	0	0
				Knee		
Femur	0	-				
Tibia	0	0				
Patella	1	-				
Tibio-fibular						
Proximal	1	1				
Distal	1	0				
Ankle joints						
Tibio-talar	1(talus)	0				
Invertarsal	1(talo-calcaneal)	1				
Tarsometatarsal	1(1st & 2nd toes)	1(1st & 5th toes)				
Metatarsal-phalangeal						
Interphalangeal						
Proximal	-	-				
Distal	-	-				

		RIGHT	LEFT		
Sacral	-				
Coccygeal	-				
Claviculo-manubrial	-		-		
Manubrio-corporal	-				
Xiphoid	-				
Costal					
Head		0(1 rib only)	-		
Costal-chondral		0(1 rib only)	-		
Shoulder					
Acromio-clavicular	-		-		
Glenoid fossa	0		-		
Head of humerus	-		-		
Elbow					
Humerus	-		-		
Radius	-		-		
Ulna	-		-		
Radio-ulnar					
(Proximal)	-		-		
(Distal)	-		-		

## DESCRIPTIVE NOTES:

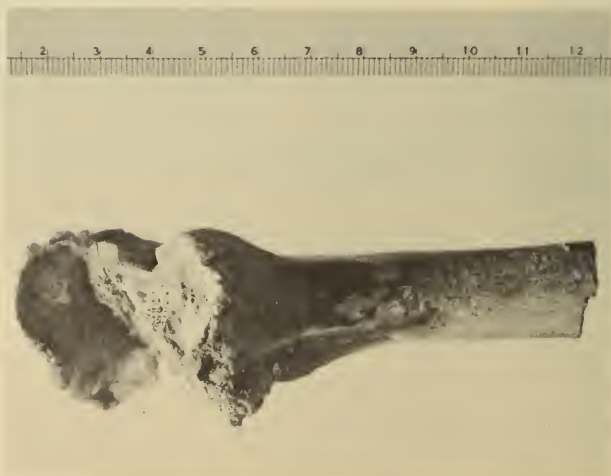
The superior and inferior articular facets (processes) of lumbar intervertebral joint No. 4 show stage 4 osteophytosis. The symphysis pubis of this specimen presents a stage 5 flipping on its anterior edge.

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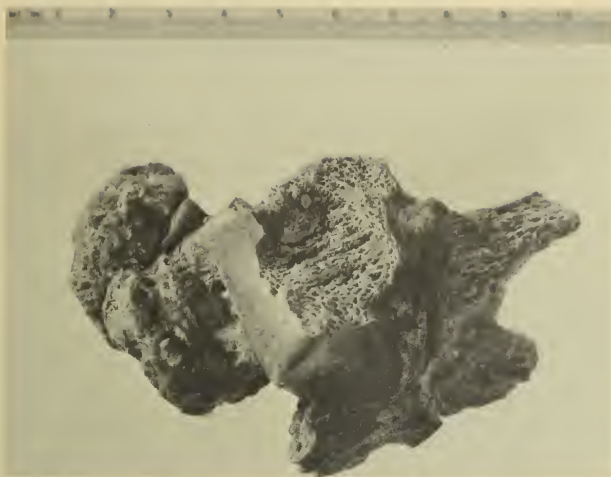
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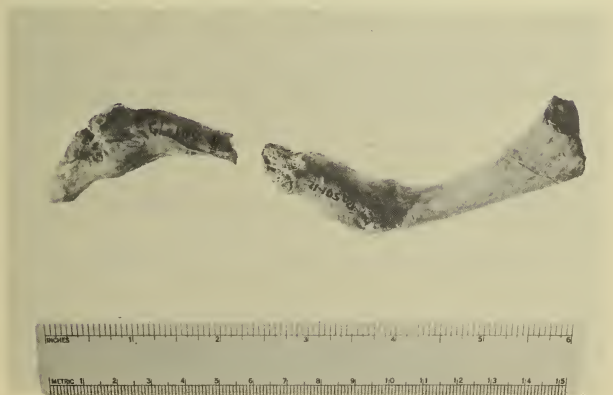
(Fig. 1) Ra501-5. Five Vertebrae Showing Progressive Increase in Osteoarthritis.



(Fig. 2) Ra501-9. Right Ulna with Stage 5 Lipping (Osteoarthritis).

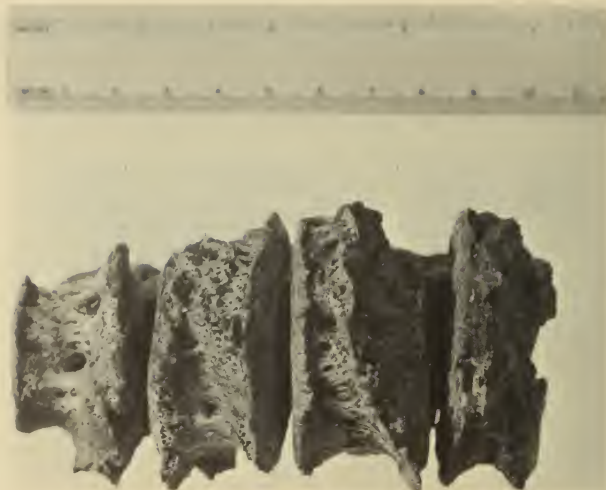


(Fig. 3) Ra501-12. Osteoarthritic Ankle Bones.



(Fig. 4) Ra501-12. Right Clavicle Showing Traumatic Fracture.





(Fig. 5) Ra501-12. Lumbar Vertebrae with Severe Osteoarthritis.



(Fig. 6) Ra501-12. Healing Traumatic Fracture of Right Ulna and Radius. Secondary Osteoarthritis of Wrist Joint Present.





(Fig. 7) Ra501-12. Osteoarthritis of Mandibular Fossa with Formation of a "New Articulating Socket."



(Fig. 8) Ra501-15. Extensive Pitting, Roughness, Atrophy, and Marked Degenerative Changes of Left Glenoid Fossa and Head of Humerus. (Changes secondary to trauma to shoulder prior to union of distal humeral epiphysis.)



(Fig. 9) Ra501-15. Right Tibia with Osteomyelitis.

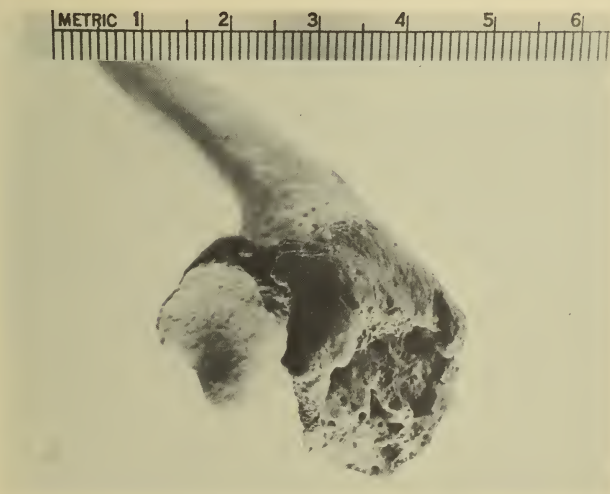


(Fig. 10) Ra501-15. Right Temporo-mandibular Joint with Osteoarthritic Changes.



(Fig. 11) Ra501-16. Trauma to Right Foot. Ankylosis of Two Phalanges of Great Toe. Destruction of End of First Phalanx of Second Toe, and Distal End of Right Metatarsal V.

Ra501-29. Osteoarthritis of Foot. Left Metatarsal I, Marked Lipping at Distal End. Left Metatarsal II and First Phalanx. Marked Lipping of Navicular, Triquetrum and Pisiform.



(Fig. 12) Ra501-17. Avulsion of Triceps Insertion into Olecranon Process of Right Ulna.



(Fig. 13) Ra501-18. Alveolar Abscess of Right Maxilla. Alveoloclasia Present.



(Fig. 14) Ra501-18. Pronounced Dental Attrition.



(Fig. 15) Ra501-18. Healed Traumatic Fracture of Left Distal Radius.



(Fig. 16) Same as No. 15. Posterior View.



(Fig. 17) Ra501-19. Osteoarthritis of Foot Bones (Right Talus, Metatarsal I, Phalanx I and II of Great Toe, and Two Sesamoid Bones).



(Fig. 18) Ra501-19. Lumbar Vertebrae Showing Osteoarthritic Changes Secondary to Hemangiomatous Destruction of Body of L, II.

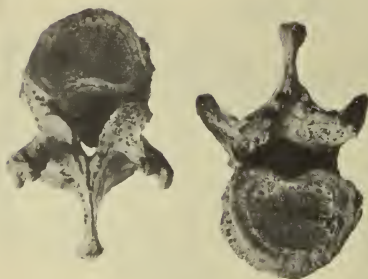


(Fig. 19) Ra501-19. Lumbar Vertebrae Showing Osteoarthritic Changes Secondary to Hemangiomatous Destruction of Body of L, II.



(Fig. 20) Same as No. 19.





(Fig. 21) Ra501-19. Thoracic Vertebrae Showing Unilateral Pitting and Osteophytosis of Right Superior and Inferior Articular Facets.



(Fig. 22) Ra501-19. Traumatic Fracture of Right Ulna with Pseudoarthrosis and Osteoarthritic Changes.





(Fig. 23) Ra501-20. Healed Traumatic Fracture of Left Humerus.



(Fig. 24) Ra501-20. Erosion of Acetabular Fossa of Left Innominate Bone Secondary to Benign Tumor.



(Fig. 25) Ra501-29. Osteoarthritic Changes in Odontoid Fossa and Process.



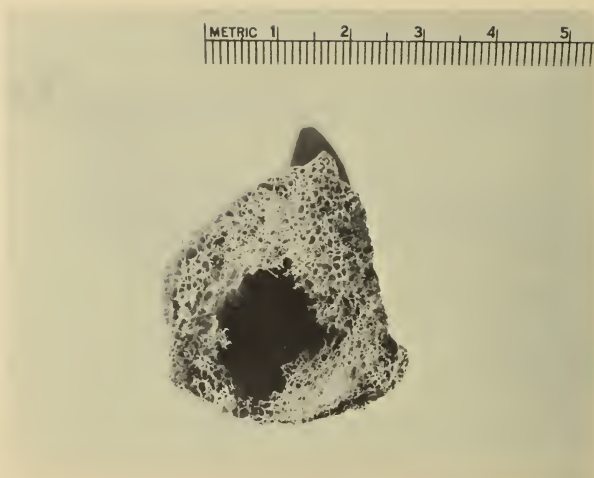
(Fig. 26) Ra501-29. Osteoarthritic Changes at Articulating Facets of Rib and Transverse Process of Vertebra.



(Fig. 27) Ra501-29. Moderate Capitular Osteoarthritic Lipping of Left Radius. Marked Capitular Lipping of Right Radius. Marked Lipping of Right Proximal Ulna and Right Distal Humerus. Ra 501-19. Marked Osteoarthritic Lipping of Right Distal Humerus.



(Fig. 28) Ra502-1. Sternum with Developmental "Perforation," Fused Manubrium, and Osteoarthritic Lipping at Sterno-clavicular Joints.



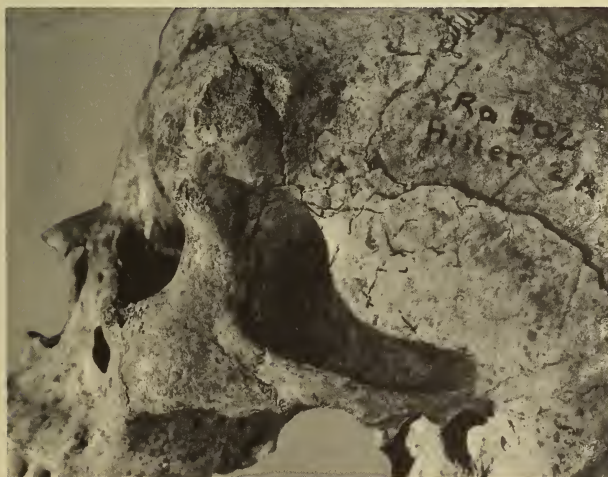
(Fig. 29) Ra502-1. Transverse Section of Tibia Showing Marked Osteoporosis.



(Fig. 30) Ra502-1. Rheumatoid Spondylitis.



(Fig. 31) Ra502-1. Marked Pathological Changes in Both Femora from Osteomyelitis.



(Fig. 32) Ra502-2a. Osteoma of Left Frontal Bone.



(Fig. 33) Ra502-2b. Left: Osteoarthritic Changes at Symphysis Pubis of Fifty-Three-Year-Old Female. Right: Symphysis Pubis of Multiparous Negro Female for Comparison.









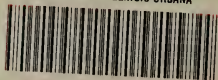








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